

Spectrum Analyzer

GSP-930

USER MANUAL

REVISION 1.1 APRIL 2012



ISO-9001 CERTIFIED MANUFACTURER

GW INSTEK

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S SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow during operation and storage. Read the following before any operation to insure your safety and to keep the instrument in the best possible condition.

Safety Symbols

These safety symbols may appear in this manual or on the instrument.



WARNING

Warning: Identifies conditions or practices that could result in injury or loss of life.



CAUTION

Caution: Identifies conditions or practices that could result in damage to the instrument or to other properties.



DANGER High Voltage



Attention Refer to the Manual



Earth (ground) Terminal



Frame or Chassis Terminal



Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Safety Guidelines

General Guideline



CAUTION

- Do not place any heavy object on the instrument.
- Avoid severe impact or rough handling that leads to damaging the instrument.
- Do not discharge static electricity to the instrument.
- Use only mating connectors, not bare wires, for the terminals.
- Ensure signals to the RF input do not exceed +30dBm.
- Ensure reverse power to the TG output terminal does not exceed +30dBm.
- Do not supply any input signals to the TG output.
- Do not block the cooling fan opening.
- Do not disassemble the instrument unless you are qualified.

(Measurement categories) EN 61010-1:2010 specifies the measurement categories and their requirements as follows. The instrument falls under category II.

- Measurement category IV is for measurement performed at the source of low-voltage installation.
- Measurement category III is for measurement performed in the building installation.
- Measurement category II is for measurement performed on the circuits directly connected to the low voltage installation.
- Measurement category I is for measurements performed on circuits not directly connected to Mains.

Power Supply



WARNING

- AC Input voltage range: 100V~240V
 - Frequency: 50/60Hz
 - To avoid electrical shock connect the protective grounding conductor of the AC power cord to an earth ground.
-

Battery



CAUTION

- Rating: 10.8V, 6 cell Li-ion battery
- Turn off the power and remove the power cord before installing or removing the battery.

Cleaning

- Disconnect the power cord before cleaning.
- Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid.
- Do not use chemicals containing harsh material such as benzene, toluene, xylene, and acetone.

Operation
Environment

- Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below)
- Temperature: 5°C to 45°C
- Humidity: <90%

(Pollution Degree) EN 61010-1:2010 specifies the pollution degrees and their requirements as follows. The instrument falls under degree 2.

Pollution refers to “addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity”.

- Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.
- Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.

Storage
environment

- Location: Indoor
- Temperature: -20°C to 70°C
- Humidity: <90%

Disposal

Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact.

Power cord for the United Kingdom

When using the instrument in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons


 **WARNING: THIS APPLIANCE MUST BE EARTHED**

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

| | |
|----------------|--------------|
| Green/ Yellow: | Earth |
| Blue: | Neutral |
| Brown: | Live (Phase) |



As the colours of the wires in main leads may not correspond with the coloured marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with either the letter E, the earth symbol  or coloured Green/Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, a cable of 0.75mm² should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any exposed wiring from a cable, plug or connection that is engaged in a live socket is extremely hazardous. If a cable or plug is deemed hazardous, turn off the mains power and remove the cable, any fuses and fuse assemblies. All hazardous wiring must be immediately destroyed and replaced in accordance to the above standard.

GETTING STARTED

This chapter provides a brief overview of the GSP-930, the package contents, instructions for first time use and an introduction to the front panel, rear panel and GUI.



| | |
|----------------------------------|---------------|
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GSP-930 Introduction

The GSP-930 is the most advanced spectrum analyzer GW Instek has produced to date. The GSP-930 features a split window display to view data in spectrum, topographic or spectrographic views.

Main Features

| | |
|-------------|--|
| Performance | <ul style="list-style-type: none">• 9kHz~3GHz bandwidth• 1Hz resolution• Nominal RBW accuracy of 5% <750kHz, 8% @>750kHz• Video bandwidth 1Hz~1MHz (10 steps)• Amplitude measurement range: DANL~30dBm (frequency dependent)• Input attenuation: 0 ~ 50dB• Phase noise: < -88dBc/Hz@1GHz, 10kHz |
| Features | <ul style="list-style-type: none">• 10%-step increments for RBW bandwidth• Three display modes: Spectrum, Topographic and Spectrographic• Split window display• Built-in EMI filter• Auto Wake-up• Built-in preamplifier• Gate sweep• Marker Frequency counter• Two operating modes: Spectrum and Power Meter mode• SEM measurement• ACPR measurement• OCBW measurement |

- Channel power measurement
 - Demodulation analyzer
 - Diverse marker functions and features with Peak Table
 - Sequence function to automatically perform pre-programmed sequential operations
 - Optional battery operation
-

Interface

- 8.4 color LCD (800×600)
- On-screen menu icons
- DVI-I video output
- RS-232 with RTS/CTS hardware flow control
- USB 2.0 with support for USB TMC
- LAN TCP/IP with LXI support
- Optional GPIB/IEEE488 interface
- IF output @ 886MHz
- Headphone output
- REF (reference clock) input/output BNC ports
- Alarm/Open collector output BNC port
- Trigger/Gate input BNC ports
- RF N-type input port
- Tracking generator output
- DC +7V/500mA output SMB port

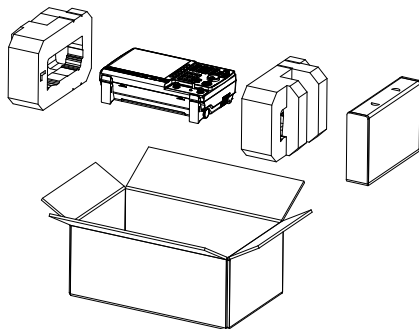
Accessories

| Standard Accessories | Part number | Description |
|----------------------|------------------|--|
| | Region dependant | User manual |
| | Region dependant | Power cord |
| Options | Option number | Description |
| | Opt1. | Tracking generator |
| | Opt2. | Battery (11.1V/5200mAH Li-ion battery) |
| | Opt3. | GPIB interface (IEEE 488 bus) |
| Optional Accessories | Part number | Description |
| | PWS-06 | USB Average Power Sensor (up to 6200 MHz; -32 to 20 dBm) |
| | GRA-415 | 6U Rack mount kit |

Package Contents

Check the contents before using the GSP-930.

Opening the box

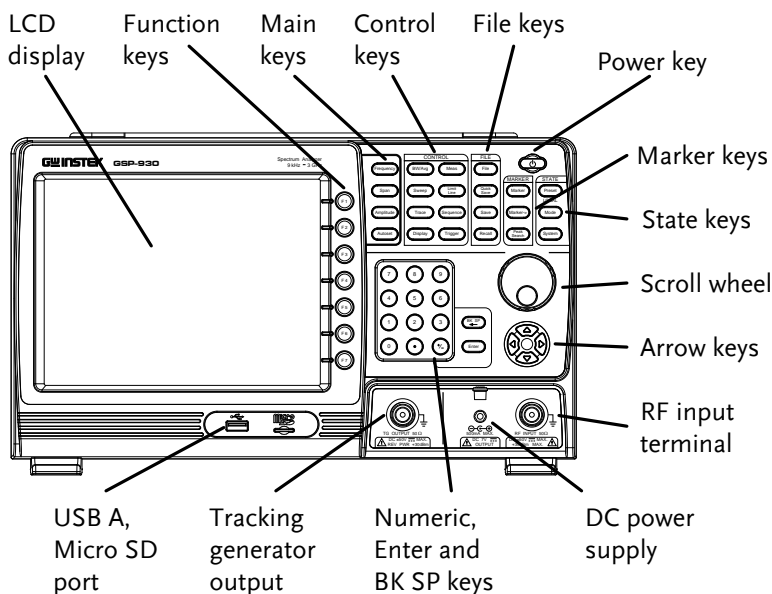


Contents (single unit)



- Main unit
(may include optional GPIB, TG output)
- Quick Start manual
- User Manual CD
- Power cord x1 (region dependent)
- Optional battery pack
- Calibration certificate


Appearance

GSP-930 Front Panel

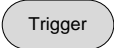
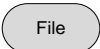
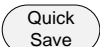
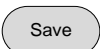
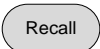


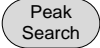




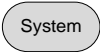
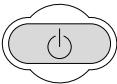
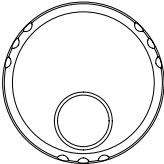
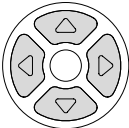
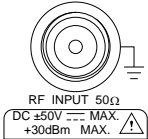
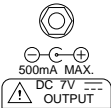
LCD display 800×600 color LCD display. The display shows the soft keys for the current function, frequency, amplitude and marker information.

Function keys  ~  The F1 to F7 function keys directly correspond to the soft keys on the right-hand side of display.

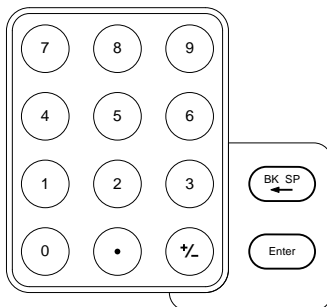
Main keys  Sets the center frequency, start frequency, stop frequency, center frequency step and frequency offset values.

| | | |
|--------------|------------|--|
| | Span | Sets the span, with options for full span, zero span and last span. |
| | Amplitude | Sets the amplitude reference level, attenuation, pre-amplifier controls, scale and other options for attenuation and scale. |
| | Autoset | Automatically searches the peak signal with maximum amplitude and displays it with appropriate horizontal and vertical scales. |
| Control keys | BW/Avg | Sets the resolution bandwidth, video bandwidth, average type and turns the EMI filter on/off. |
| | Sweep | Sets the sweep time and gate time. |
| | Trace | Sets traces and trace related functions. |
| | Display | The Display key configures the windowing mode and basic display properties. |
| | Meas | Accesses measurement options such as ACPR, OCBW, demodulation measurements, SEM, TOI and other advanced measurements. |
| | Limit Line | Sets and tests Pass/Fail limit lines. |
| | Sequence | Access, set and edit program sequences. |

| | | |
|--------|---|--|
| |  | Sets the triggering modes. |
| File |  | File utilities options |
| |  | The Quick Save utility allows you to save either the state, trace, screen limit line, correction or sequence with only a single press. |
| |  | Save the trace, state etc., and save options. |
| |  | Recall the trace, state etc., and recall options. |
| Marker |  | Turns the Markers on/off and configures the markers. |
| |  | The <i>Marker-></i> key positions the markers on the trace. |
| |  | Finds each maximum and minimum peak. Used with the Marker function. |
| State |  | The <i>Preset</i> key will restore the spectrum analyzer to the Factory or User-defined settings. |
| | LOCAL | The Preset key will also return the instrument back to local control after it has been in remote control mode. |

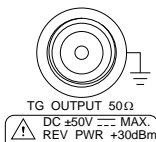
| | | |
|-------------------|---|---|
| |  | The <i>Mode</i> key sets the spectrum analyzer to either Spectrum or Power Meter mode. |
| |  | The <i>System</i> key shows system information, settings and other system related functions. |
| Power key |  | Turns the instrument on/off. |
| Scroll wheel |  | Edit values, select listed items. |
| Arrow keys |  | Increment/decrement values (in steps), select listed items. |
| RF input terminal |  | RF input port. Accepts RF inputs. <ul style="list-style-type: none"> • Maximum input: +33dBm • Input impedance: 50Ω • Maximum DC voltage: ±50V • N-type: female |
| DC power supply |  | SMB port supplies power for optional accessories. <ul style="list-style-type: none"> • DC +7V • 500mA Max. |

Numeric keypad



The numeric keypad is used to enter values and parameters. It is often used in conjunction with the arrow keys and scroll wheel.

TG output port



The Tracking Generator (TG) output source.

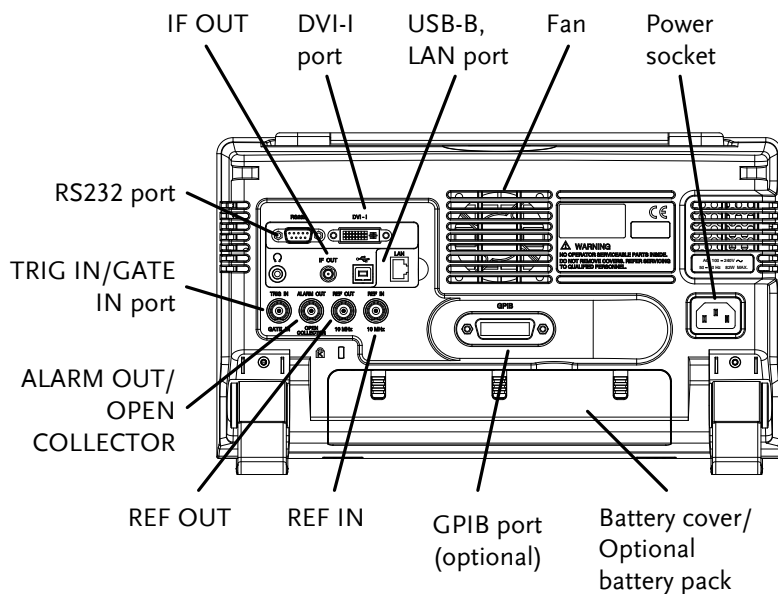
- N-type: female
- Input impedance: 50Ω
- Output power: -50dBm to 0dBm
- Maximum reversed power: +30dBm

USB A, Micro SD

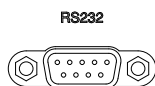


USB A port, Micro SD port for saving/recalling settings/files.

Rear Panel



RS232



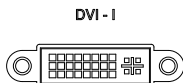
RS232 9 pin DSUB port.

IF OUT



SMA IF Out port.

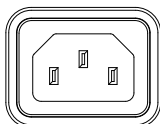
DVI-I



DVI video out port. Supports SVGA (800X600) @ 60Hz.

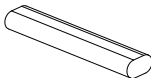
Fan

Power Socket



Power Socket:
100~240V, 50/60Hz.

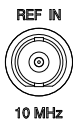
Battery pack



Voltage: 10.8V

Capacity: 5200mAh

REF IN



BNC female reference input.

REF OUT



BNC female reference output:
10MHz, 50 Ω impedance

Security Lock



ALARM OUT



BNC female open collector Alarm
output.

TRIG IN/GATE IN



BNC female 3.3V CMOS trigger
input/gated sweep input.

Phone



3.5mm stereo headphone jack
(wired for mono operation)

USB B



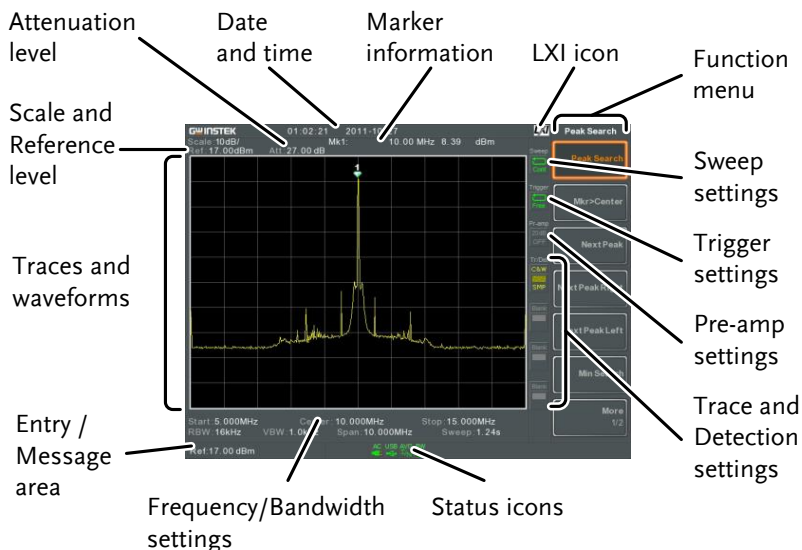
USB B Device port. USB 1.1/2.0

LAN







RJ-45 10Base-T/100Base-Tx











Display













| | |
|--------------------|--|
| Reference level | Displays the reference level. For details, see page 46. |
| Attenuation | Displays the vertical scale (attenuation) of the input signal. For details, see page 47. |
| Date/Time | Displays the date and time. See page 106 for details. |
| Marker information | Displays marker information. For details see page 83. |
| LXI icon | This icon indicates the status of the LXI connection. For details, see page 196. |
| Function menu | Soft menu keys associated with the F1 to F7 function keys to the right of the display. |

| | | |
|-------------------------------------|--|--|
| Sweep settings |  | Sweep icon that shows the sweep status. See page 66 for details. |
| Trigger settings |  | Trigger icon that shows the trigger status. See page 79 details. |
| Pre-amp settings |  | Pre-amplifier icon that shows the Pre-amplifier status. See from page 48 for details. |
| Trace and detection settings |  | Trace icon that shows the trace type and the detection mode used for each trace. See from page 72 for details. |
| Status Icons | Displays the interface status, power source status, and alarm status, etc. See the Status Icon Overview on page 22 for a list of the status icons. | |
| Frequency/ Bandwidth settings | Displays the Start, Center and Stop frequencies, RBW, VBW, Span and Sweep settings. | |
| Entry/Message area | This area is used to show system messages, errors and input values/parameters. | |
| Trace and waveforms | Main display showing the input signals, traces (page 72), limit lines (159) and marker positions (83). | |

Status Icon Overview

| | | |
|---------------------|---|---|
| PreAmp |  | Indicates that the pre amplifier is on. |
| AC |  | Shown when running on AC power. |
| AC Charge |  | Shown when the AC power is charging the battery. |
| Alarm Off |  | Alarm buzzer output is currently off. |
| Alarm On |  | Alarm buzzer output is currently on. |
| Amplitude Offset |  | Indicates that the amplitude-shift is active. This icon appears when amplitude-related functions are used: Reference level offset Amplitude Correction Input Z = 75Ω Input Z cal >0 |
| Battery indicator |  ~  | Indicates the battery charge. |
| Bandwidth Indicator |  | Indicates that the RBW or VBW settings are in manual mode. |
| Average |  | Indicates that the Average function is active. |

| | | |
|--------------------|---|---|
| External Lock |  | Indicates that the system is now locked and refers to the external reference input signal |
| External Trigger |  | External trigger signal is being used. |
| Math |  | Trace math is being used. |
| Sequence Indicator |  | Shown when a sequence is running. |
| Sweep Indicator |  | Indicates that the sweep time is manually set. |
| Tracking generator |  | Indicates the tracking generator is turned on. |
| TG Normalization |  | Indicates that the tracking generator has been normalized. |
| Wake-up clock |  | Indicates that the wake-up clock is turned on. |
| USB |  | Indicates that a USB flash drive is inserted into the front panel and is recognized. |
| Micro SD |  | Indicates that a micro SD card is inserted into the front panel and is recognized. |

First Use Instructions

Use the procedures below when first using the GSP-930 to tilt the stand, insert the battery pack, power up the instrument, setting the internal clock, the wake-up clock, updating the firmware and restoring the default settings. Lastly, the Conventions sections will introduce you to the basic operating conventions used throughout the user manual.

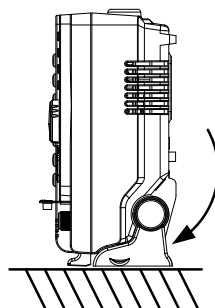
Tilting the Stand

Description

The GSP-930 has two adjustable rubber feet that can be used to position the instrument into two preset orientations.

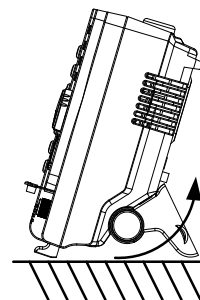
Upright Position

Tuck the feet under the bottom of the instrument to stand the instrument upright.



Leaning Position

Pull the feet back to have the instrument leaning back.



Inserting the Battery Pack

Description The GSP-930 has an optional battery pack. The battery should be inserted before power is connected to the AC power socket and before the unit is turned on.

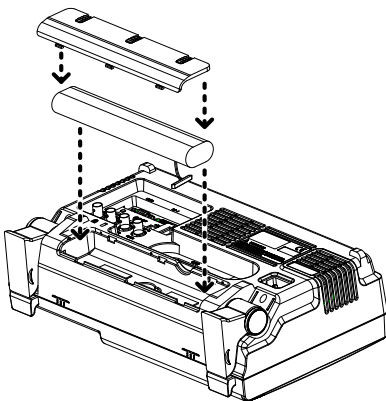
- Steps**
1. Ensure the power is off and the AC power is disconnected.
 2. Remove the battery cover.
 3. Insert the battery as shown in the diagram below.
 4. Replace the battery cover.

Display Icon



The battery icon is displayed when GSP-930 is running on battery power.

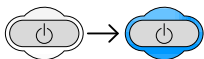
Insertion Diagram



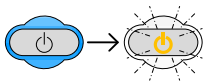
Power UP

Steps

1. Insert the AC power cord into the power socket.
2. The power button exterior will be lit blue to indicate that the GSP-930 is in standby mode.



3. Press the power button to turn the GSP-930 on.
4. The power button will turn orange and the GSP-930 will start to boot up.



Note

It takes approximately 1.5 minutes for the GSP-930 to fully startup.

Power Down

Description The GSP-930 has two methods to power down: Normal and Forced Power Down.

The normal power down method will save the system state and end any running processes. The state is saved for the next time the instrument is turned back on.

The forced power down method only does a minimum state save.

Normal Power Down

Press the power button. The system will automatically handle the power down procedure in the following order:

- The system state is saved.
- Outstanding processes are closed in sequence.
- The LCD backlight is turned off.
- The system enters standby mode (the power key changes from orange to blue).



Note

The process takes ~10 seconds.

Forced Power Down

Press and hold the power button for ~4 seconds until the system turns off and the power button turns blue.




Note

The forced down mode might cause the GSP-930 to perform a longer system check the next time it is powered up.

Setting the Date, Time and Wake-Up Clock

| | |
|-------------|---|
| Description | The GSP-930 can be setup to power-up automatically using the Wakeup Clock function. This feature is useful to wake-up the instrument early and eliminate settling time. |
|-------------|---|

| | |
|-------------|---|
| System Date | Example: Set the System Date to March 1, 2012 |
|-------------|---|


1. Press  > *Date/Time*[F4] > *Set Date*[F1] > *Year*[F1].
 2. Press *2012* > *Enter*[F1].
 3. Press *Month*[F2] > *3* > *Enter*[F1].
 4. Press *Day*[F3] > *1* > *Enter*[F1].
 5. Press *Return*[F7].
-



Note

The System Date will be shown at the top of the display.

| | |
|-------------|---|
| System Time | Example: Set the System Time to 9.00 AM |
|-------------|---|

1. Press  > *Date/Time*[F4] > *Set Time*[F2] > *Hour*[F1].
2. Press *9* > *Enter*[F1].
3. Press *Minute*[F2] > *0* > *Enter*[F1].
4. Press *Second*[F3] > *0* > *Enter*[F1].
5. Press *Return*[F7].




Note

The System Time will be shown at the top of the display.

System Wake-Up Clock

Example: Set the GSP-930 to wake up at 9.00 AM

1. Press  > *Date/Time[F4]* > *Wake-Up Clock[F3]* > *Clock[F1]*.
2. Press *Clock[F1]* to choose a clock (1 ~ 7).
3. Press *State[F2]* to turn the clock on/off.
4. Press *Hour[F3]* > 9 > *Enter[F1]*.
5. Press *Minute[F4]* > 0 > *Enter[F1]*.
6. Press *[F5]* and choose *Rept.* (Repeat) or *Single*.
7. Press *Select Date[F6]* and select a day.
8. Press *Return[F7]* to save the Wake-Up Clock settings.



Note

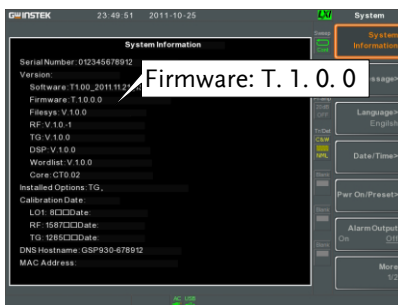
The system time is kept with the CR2032 clock battery. If the system time/ wake up clock can no longer be set, please replace the clock battery. See page 206.

Firmware Update

Description The GSP-930 allows the firmware to be updated by end-users. Before using the GSP-930, please check the GW Instek website or ask your local distributor for the latest firmware.

System version Before updating the firmware, please check the firmware version.

1. Press **(System)** > *System Information* [F1].
2. The firmware will be listed on the display.



3. Press any other key to exit out of the System Information screen.
4. To upgrade the firmware, insert the new firmware onto a USB flash drive or Micro SD card and put the drive/ card into the appropriate front panel port. The firmware files should be located in a directory named "gsp930".
5. Press **(System)** > *More 1/2* [F7] > *Upgrade* [F3].

6. The spectrum analyzer will automatically find the firmware on the USB flash drive and start to update the firmware. When finished, the message “Upgrade is finished” will be shown at the bottom of the screen followed by “Rebooting”.



7. The system will automatically restart after the rebooting message.



Note

The upgrade process may take a few minutes.


Restoring Default Settings

Description

The factory default settings or user-defined presets can be easily restored using the Preset key on the front panel. By default, the factory default settings are restored with the Preset key.

For details on how to configure the preset settings, please see page 109.

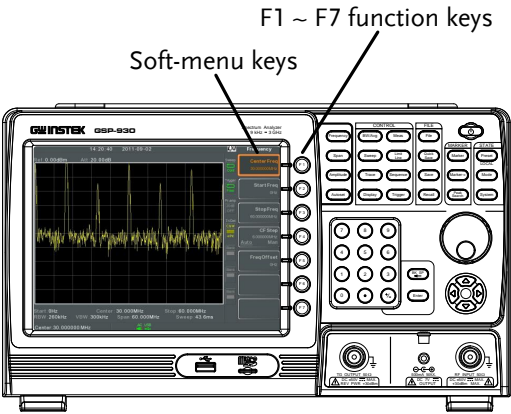
Steps

1. Press .
2. The spectrum analyzer will load the preset settings.

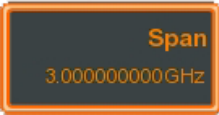
Conventions

The following conventions are used throughout the user manual. Read the conventions below for a basic grasp of how to operate the GSP-930 menu system and front panel keys.

Soft Menu keys The F1 to F7 function keys on the right side of the display correspond directly to the soft-menu keys on their left.

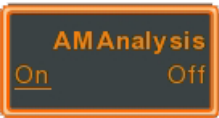


Input Parameter Values



Selecting this type of menu key will allow you to enter a new value with the numeric keypad or increment/decrement the value using the scroll wheel.

Toggle State



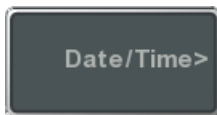
Pressing this menu key will toggle the state.

Toggle State &
Input Parameter



Pressing this menu key will allow you to toggle the state of the function between Auto and Man(ual) state. When in the Man state, the parameter value can be manually edited. Use the numeric keypad to enter the new value or use the scroll wheel to increment/decrement the current value.

Sub Menu



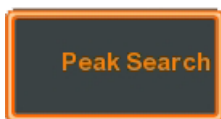
Pressing this menu key will enter a submenu.

Sub Menu to
select parameter



Pressing this menu key will enter a submenu to select a parameter.

Active Function

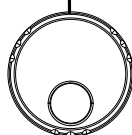
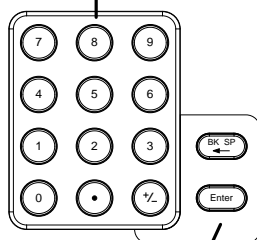


Pressing this type of menu key will activate that function. The menu key will be highlighted to show it is the active function.

Parameter input

Numerical keypad

Scroll wheel



Backspace, Enter keys

Directional arrow keys

Parameter values can be entered using the numeric keypad, the scroll wheel and occasionally with the arrow keys.

Using the numeric keypad

When prompted to enter a parameter, use the number keys (0~9), the decimal key (.) and the sign key (+/-) to enter a value. After a value has been entered, the soft-menu keys can be used to select the units.

The value of the parameter is shown at the bottom of the screen as it is edited.



Edited parameter

Back Space

Use the backspace key to delete the last character or number entered.

| | |
|------------------------|---|
| Using the scroll wheel | Use the scroll wheel to alter the current value. Clockwise increases the value, anti-clockwise decreases the value. |
| Directional arrows | Use the directional arrows to select discrete parameters or to alter values by a coarser resolution than the scroll wheel. Left decreases the value, right increases the value. |

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Frequency Settings

Center Frequency

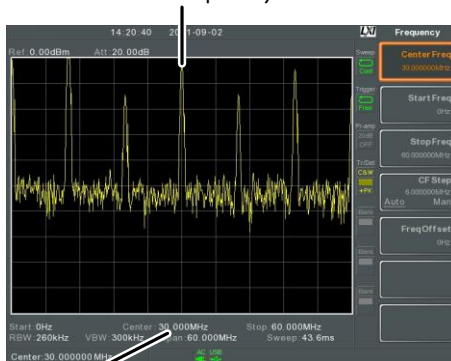
Description The center frequency function sets the center frequency and centers the display to the center frequency.

Operation 1. Press **Frequency** > **Center[F1]** and enter the frequency and unit.

Range: 0kHz~3GHz
Resolution: 1Hz
Default: 1.5GHz

Display

Center frequency



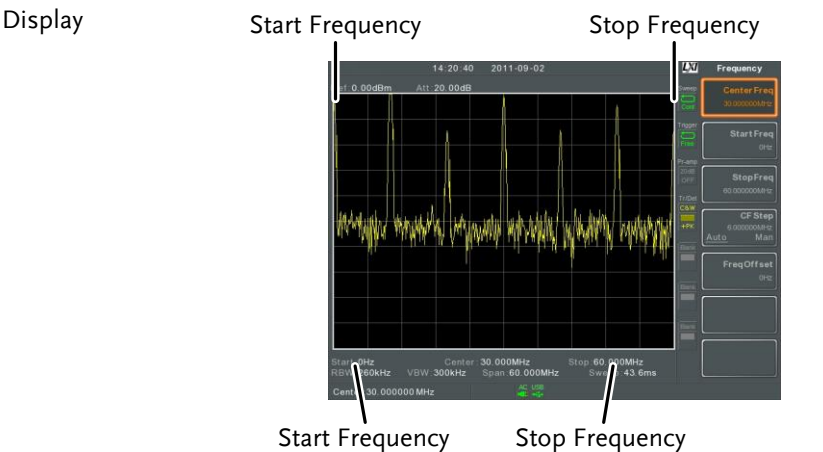
Set Center Frequency


Start and Stop Frequency

Description The start/stop frequency function will set the start and stop frequency of the span.

- Operation
- 1. To set the start frequency, press **Frequency** > *Start Freq[F2]* and enter the frequency and unit.
 - 2. To set the stop frequency, press **Frequency** > *Stop Freq[F3]* and enter the frequency and unit.

Range: 0kHz~3GHz
Resolution: 1Hz
Default Start frequency: 0Hz
Default Stop frequency: 3GHz



 **Note**

The start and stop frequency can change when the span settings are used.
The stop frequency must be set higher than the start frequency (for spans ≠ 0), otherwise the span will be automatically set to 100Hz.

Center Frequency Step

Description The CF Step function sets the step size of the center frequency when using the arrow keys.

When the arrow keys are used to alter the center frequency, each press will move the center frequency by the step size specified by the CF Step function.

In auto mode, the center frequency step size is equal to 10% (1 division) of the span.

- Operation**
1. Press **Frequency** > **CF Step[F4]** and set the CF Step to Auto or Man.
 2. If Man was selected, set the frequency and unit of the center frequency step size.

Manual Range: 100Hz~3GHz
Auto range: 1/10 of span frequency

Display



Frequency Offset

Description The Freq Offset function allows you to add an offset to the Center, Start and Stop frequencies as well as the marker frequencies. The offset value does not affect displaying the trace on the display.

Operation 1. Press **Frequency** > *Freq Offset[F5]* and set the offset value.

 The Center, Start, Stop and Marker frequencies are updated accordingly.

Offset Range: 0Hz~100GHz

Display



Span Settings

Span

Description The Span function will set the frequency range of the sweep. The sweep will be centered around the center frequency.

Setting the span will alter the start and stop frequencies.

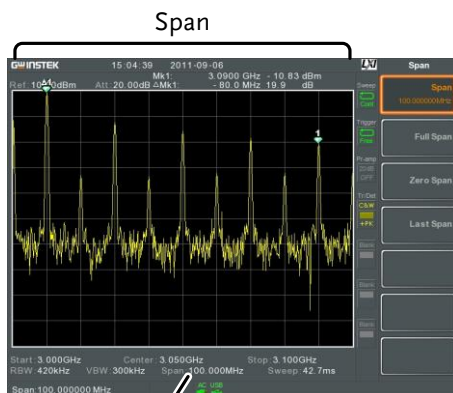
Operation 1. Press Span > *Span[F1]* and enter the span frequency range and unit.

Range: 0kHz~3GHz

Resolution: 1Hz

Default Span: 3GHz

Display




Set Span

Full Span

Description The Full Span function will set the span to the full frequency range.

 This function will set the start and stop frequencies to 0Hz and 3GHz respectively.

Operation 1. Press  > *Full Span*[F2].

Zero Span

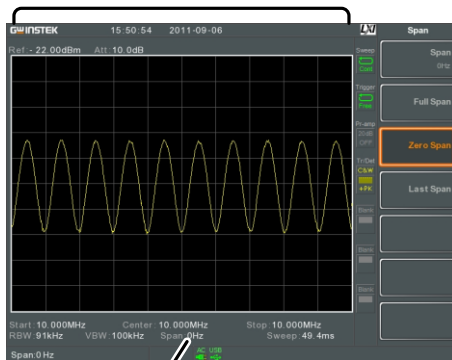
Description The Zero Span function will set the frequency range of the sweep to 0Hz and fixes the start and stop frequencies to the center frequency. The Zero Span function measures the time domain characteristics of the input signal at the center frequency. The horizontal axis is displayed in the time domain.

Operation 1. Press  > *Zero Span*[F3].

 The span changes accordingly.

Display

Time domain



0Hz Span

Example: Amplitude modulation



Note

The measurement functions such as TOI, SEM, CNR, CTB, CSO, ACPR, OCBW, phase, Jitter and NdB are not available with the zero span setting:

Last Span

Description

The last span function returns the spectrum analyzer to the previous span settings.

Operation

1. Press Span > *Last Span*[F4].

Amplitude Settings

The vertical display scale is defined by the reference level amplitude, attenuation, scale and external gain/loss.

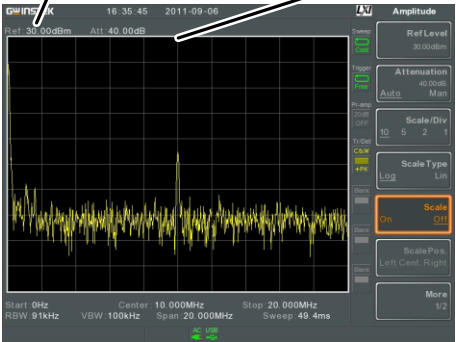
Reference Level

Description The reference level defines the absolute level of the amplitude on the top graticule in voltage or power.

Operation 1. Press **Amplitude** > *Ref Level[F1]* and enter the reference level amplitude and unit.

Range: -120dBm ~ 30dBm
Units: dBm, W, V, dBmV, dBuV
Resolution: 1dBm

Display Ref Level reading Reference Level



Attenuation

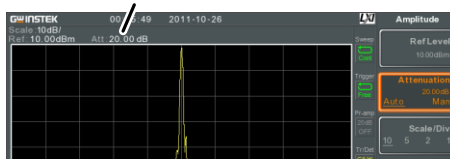
Description The attenuation of the input signal level can set to automatic (Auto) or manual (Man). When the attenuation is set to Man, the input attenuator can be changed manually in 1dB steps.

- Operation**
1. Press **Amplitude** > *Attenuation*[F2] and select Auto or Man.
 2. If Man was selected, enter the attenuation level and unit.

Range: 0dBm ~ 50dBm
 Units: dBm
 Resolution: 1dB


Display

Attenuation level



Scale/Div


Description Sets the logarithmic units for the vertical divisions when the scale is set to Log.

Operation 1. Press  > *Scale/Div*[F3] repeatedly to select the vertical division units.

Unit Range: 10, 5, 2, 1


Display Scale




 Note The Scale/Div function is only selectable when the scale is set to Log (logarithmic).

Scale Type

Description Sets the vertical scale in linear or logarithmic units.
By default the linear scale is set to volts and the logarithmic scale is set to dBm.

Operation 1. Press  > *Scale Type*[F4] and set the vertical scale to Log or Lin.

 Note If the unit scale is changed (i.e. dBm → volts), the *displayed* vertical scale type will remain in the set linear or logarithmic setting.

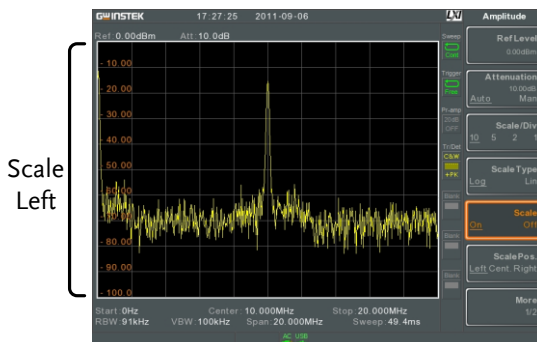
View Scale

Description The Scale function turns the vertical scale on/off. The value of each graticule division is displayed with same units used for the Ref Level settings.

- Operation**
1. Press **Amplitude** > *Scale*[F5] to toggle the Scale on or off.
 2. Press *Scale Pos.*[F6] to toggle the position of the scale when on.


Scale position: Left, Center, Right

Display





The vertical scale is displayed on the left hand side by default.

Vertical Scale Units

| | |
|-------------|--|
| Description | Change the vertical units for both linear or logarithmic scales. |
| Operation | <ol style="list-style-type: none"> Press  > <i>More[F7]</i> > <i>Y Axis[F1]</i> and then choose the desired units. The units are changed accordingly. <p>Units: dBm, dBmV, dBuV, Watts, Volts</p> |

Reference Level Offset

| | |
|--------------|--|
| Description | <p>The Reference Level Offset function sets an offset value to the reference level to compensate for any loss or gain from an external network or device.</p> <p>The offset value does not affect the input attenuation or the on-screen trace.</p> <p>This setting will change the reference level readout, the scale readout and the marker readout.</p> |
| Operation | <ol style="list-style-type: none"> Press  > <i>More[F7]</i> > <i>RefLvlOffset[F2]</i> and set the offset level and unit. To remove the offset level, set the reference offset to 0 dB. <p>Range: 0dB ~ 50dB</p> |
| Display Icon |  The AMP icon is displayed at the bottom of the screen. |

Example:

Ref: 0dBm



Before reference level offset(offset: 0dB)

Ref: 10dBm

Reference level offset: 10dB



After reference level offset (offset: 10dB)

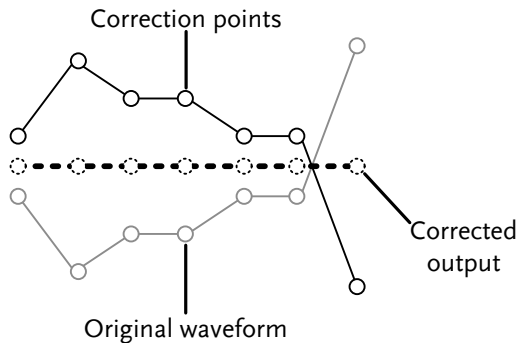
Amplitude Correction

Description

Amplitude correction adjusts the frequency response of the spectrum analyzer by altering the amplitudes at specified frequencies. This allows the spectrum analyzer to compensate for loss or gain from an external network or device at certain frequencies.

| | | |
|-------|-----------------------|---------------------|
| Range | Correction Sets: | 5 sets of 30 points |
| | Amplitude: | -40dB to +40dB |
| | Amplitude Resolution: | 0.1dB |
| | Frequency: | 9kHz to 3GHz |
| | Frequency Resolution: | 1Hz |

Display



Example: The diagram above shows how amplitude correction is used to compensate for any losses or gains at specific frequencies.

Create a Correction Set

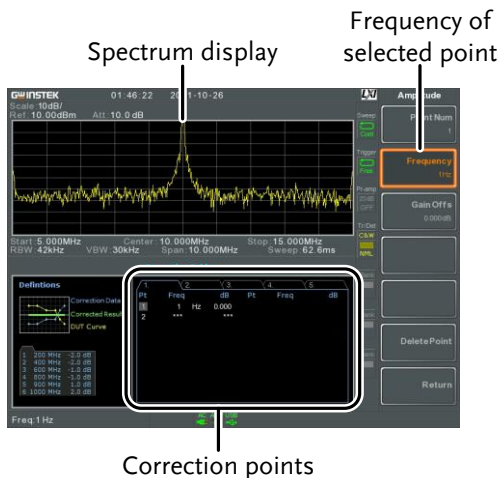
Description The GSP-930 can create and edit up to 5 sets of correction points. The correction points and associated values are all tabulated for ease of use.

Operation 1. Press **Amplitude** > *More[F7]* > *Correction[F3]* > *Correction Set[F1]* and choose a correction set to edit/create.

Correction set: 1~5

2. Press *Edit*[F3].

The GSP-930 will split into two screens. The top screen will show the waveform and the bottom screen will provide an overview of the correction points.



3. Press *Point Num*[F1] and choose a point number to edit.

Point Num: 1~30

4. Press *Frequency*[F2] and choose the frequency of the selected point.

Press *Gain Offset*[F3] and choose the amplitude of the select point. The units will be the same as those used for the vertical scale.

The frequency of the point values displayed in the correction table on the bottom display.

Correction Table



- Repeat steps 2 to 4 for any other correction points.
- To delete the selected point, press *Delete Point*[F6].
- Press *Return*[F7]>*Save Correction*[F5] to save the correction set.




Note

Note that the correction points are automatically sorted by frequency (low → high).
The correction set must be saved before it can be turned on.

The frequency values *displayed* in the correction table are rounded down for display purposes only. The actual frequency for each point can be seen in the Frequency soft-key.

Amplitude Correction On/Off


| | |
|-------------|--|
| Description | Any one of the 5 correction sets can be turned on. |
|-------------|--|

- | | |
|---------------------|--|
| Activate Correction | 1. Press  > <i>More</i> [F7]> <i>Correction</i> [F3]> <i>Correction Set</i> [F1] and choose a correction set. |
|---------------------|--|

| | |
|-----------------|-----|
| Correction Set: | 1~5 |
|-----------------|-----|


- Press *Correction*[F2] and toggle correction on.

Deactivate
Correction

1. Press  > *More*[F7]>*Correction*[F3]>
Correction[F2] to turn correction back off.

Delete Correction Set

Operation


1. Press  > *More*[F7]>*Correction*[F3]>
Correction Set[F1] and choose the correction set
to delete.

Correction Set: 1~5

2. Press *Delete Correction*[F6].
The selected correction set will be deleted.

Save Correction Set To Memory

Operation

1. Press  > *Save To*[F1] and choose the save
location.


Location: Register, Local, USB, SD

2. Press *Type*[F2]> *Correction*[F5].
3. Press *Data Source*[F3] and choose a correction.

Correction Set: Correction 1~5

4. Press *Save Now*[F7].
5. The correction set will be saved to the selected
location. For more information on Save and
Recall, please see page 170.

Recall Correction Set From Memory


- Operation
1. Press  > *Recall[F1]* and choose the recall location:

Location: Register, Local, USB, SD
 2. Press *Type[F2]* > *Correction[F5]*.
 3. Press *Destination[F3]* and choose a correction set.

Correction Set: Correction 1~5
 4. Press *Recall Now[F4]*.
 5. The current correction set will be recalled from the selected location. For more information on Save and Recall, please see page 170.

Input Impedance

Description Sets the input impedance to 75Ω or 50Ω.

- Operation
1. Press  > *More[F7]* > *Input Z[F4]* to toggle the input impedance.

Range: 75Ω, 50Ω

Input Impedance Calibration


Description When an external impedance converter module (optional accessory ADP-101) is used to convert the impedance of a device from 50Ω to 75Ω , some external loss can be induced. The Input Z Cal function can be used to compensate for these losses with an offset value.



Note

The Input Z Cal function is only available when the input impedance is set to 75Ω .

Operation

1. Press  > More[F7]>Input Z Cal[F5] and set the impedance offset.

Range: 0dB to +10dB
Resolution: 1dB

Display Icon



The AMP icon is displayed at the bottom of the screen when Input Z Cal \neq 0dB.


Using the Built-in Pre-Amplifier

Description


The built-in pre-amplifier boosts weak input signals, such as EMI testing signals, to levels that are easy to handle, over the entire frequency range. The built-in pre-amplifier on the GSP-930 has a nominal gain of 20dB.

In the Auto setting, the pre-amplifier will be automatically turned on when the reference level is less than -30dBm. When the reference level is greater than -30dBm, the pre-amplifier is turned off.

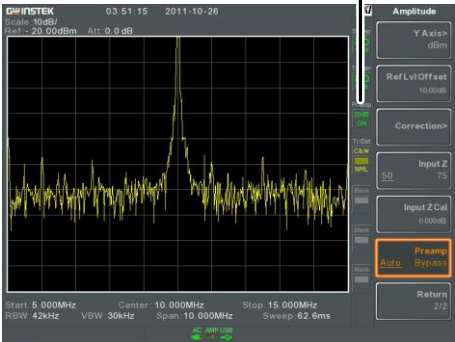
The bypass setting turns the pre-amplifier off.

Operation 1. Press  > More[F7]>Preamp[F6] to toggle the Preamp state.

Range: Auto, Bypass

Display Icon  The Pr-amp icon indicates that the pre amplifier is on.

Example: Pr-amp icon



 Note


When the pre-amplifier is on, the attenuator becomes fixed at 0dB (i.e. Attenuation = 0dB).

Autoset

The Autoset function searches the peak signals in two stages (full span & 0Hz - 100MHz limited span), picks the signal peak with the maximum amplitude, and then shows it in the display.

Using Autoset

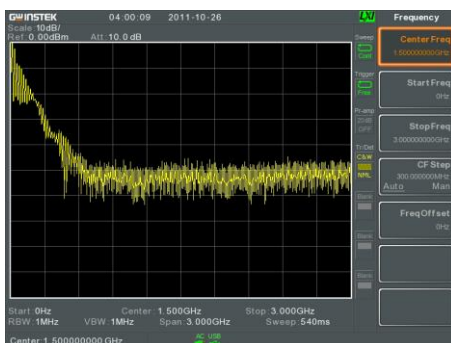
Operation

1. Press  > Autoset[F1].

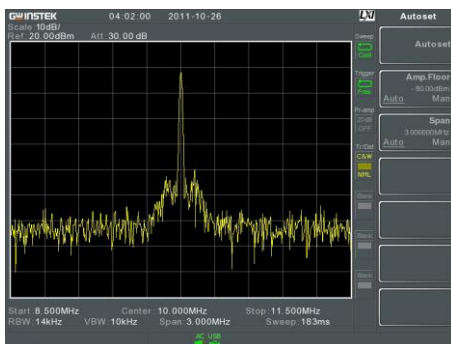
Autoset Range

Amplitude: -80dBm ~ +20dBm
Span: 100Hz ~ 3GHz

Example:



Before Autoset, preset state




After Autoset



Note

RBW, VBW and sweep settings are reset to Auto when the Autoset function is used.

Limiting the Autoset Vertical Search Range


| | |
|-------------|---|
| Description | You can set the amplitude floor so that the signals lower than the setting will be ignored by the Autoset search. |
| Operation | <ol style="list-style-type: none"> 1. Press  > <i>Amp.Floor[F2]</i> and switch the range from Auto to Man. 2. Enter the amplitude limit and unit for the Autoset search. <p>Range: -80 to +20dBm</p> |



Note

See page 48 for setting the amplitude units.



Limiting the Autoset Horizontal Search Range

| | |
|-------------|---|
| Description | You can change the frequency span limit in the display to get a better view of the Autoset result. By default, the frequency span after Autoset is set at 3MHz. |
| Operation | <ol style="list-style-type: none"> 1. Press  > <i>Span[F3]</i> and switch the range from Auto to Man. 2. Enter the span frequency for the Autoset search. <p>Manual Range: 100Hz to 3GHz</p> |

Bandwidth/Average Settings

BW/Avg key sets the resolution bandwidth (RBW), video bandwidth (VBW) and averaging functions. The resolution, sweep time, and averaging are in a trade-off relationship, so configuration should be done with care.

Resolution Bandwidth Setting (RBW)

| | |
|--------------|--|
| Description | RBW (Resolution Bandwidth) defines the width of the IF (intermediate frequency) filter that is used to separate signal peaks from one another. The narrower the RBW, the greater the capability to separate signals at close frequencies. But it also makes the sweep time longer under specific frequency spans (the display is updated less frequently). |
| Operation | <ol style="list-style-type: none"> 1. Press  > $RBW[F1]$ and set the RBW to Auto or Man. 2. Set the resolution bandwidth and unit for Man mode. <p>Mode: Auto, Man Frequency Range(3dB): 10Hz~3kHz (1-3-10 step) 10kHz~1MHz (10% step) Frequency Range(6dB): 200Hz, 9kHz, 120kHz</p> |
| Display Icon |  The BW icon is displayed at the bottom of the screen when the RBW is in Man mode. |





Note

If the RBW settings have an asterisk (*), it indicates that the -6dB filters are used.

Video Bandwidth Settings (VBW)

| | |
|-------------|--|
| Description | VBW (Video Bandwidth) defines the smoothness of the trace on the display. Combined with RBW, VBW defines the ability to sort out the target signal from surrounding noise or adjacent peaks. |
|-------------|--|

| | |
|-----------|---|
| Operation | <ol style="list-style-type: none"> 1. Press  > <i>VBW[F2]</i> and set the VBW to Auto or Man. 2. Set the video bandwidth and unit for Man mode. <p>Mode: Auto, Man Frequency Range(3dB): 1Hz~1MHz (1-3-10 step)</p> |
|-----------|---|

| | |
|--------------|--|
| Display Icon |  <p>The BW icon is displayed at the bottom of the screen when the VBW is in Man mode.</p> |
|--------------|--|

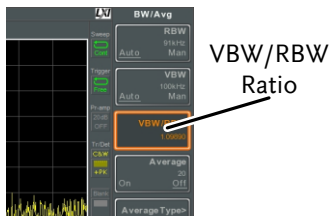
VBW/RBW Ratio

| | |
|-------------|--|
| Description | The VBW/RBW function is used to view the ratio between the video bandwidth and the resolution bandwidth. |
|-------------|--|

The VBW/RBW ratio is altered by setting the RBW and or VBW settings, see page 61 & 62 respectively.

| | |
|--------------------|--|
| View VBW/RBW ratio | <ol style="list-style-type: none"> 1. Press . 2. The ratio is displayed on the <i>VBW/RBW[F3]</i> soft key. |
|--------------------|--|

Display



Tip

Signals that are masked by the noise floor level should have a ratio of less than 1 to smooth the noise out.

Signals with strong frequency components should use a ratio equal to or greater than 1.

Average Trace

Description

The Average function averages the trace for a user-defined number of times before it is displayed. This feature smooths the noise level, but has the drawback of slowing down the display update rate.

Operation

1. Press **BW/Avg** > *Average*[F4] and toggle Average on or off.
2. Set the number of averages.

Range: 4 ~ 200
Default: 20

Display Icon

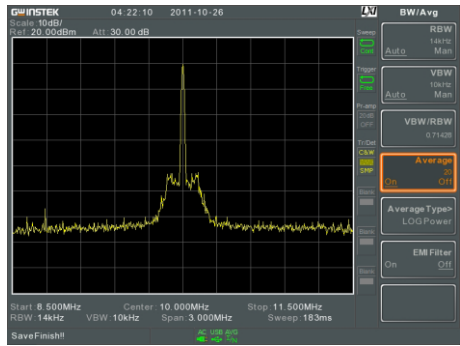


The AVG icon is displayed at the bottom of the screen when the Average function is on.

Example:



Average:Off



Average: On (20×)

Average Type


Description The Average Type function determines how the GSP-930 determines the average value.

LOG Average: Averages the trace points on a logarithmic scale.

Volt Average: Averages the amplitudes of the trace points on a linear voltage scale.

Power Average: Averages the trace points on a logarithmic scale in watts.

Operation


1. Press  > *Average Type*[F5] and choose the average type.

| | |
|----------|--|
| Range: | LOG Power, Volt Average, Power Average |
| Default: | LOG Power |

EMI Filter

Description The built-in EMI filter is used for specific measurement situations such as EMI average detection, where a higher level of sensitivity is required than the standard configuration. When turned on, the RBW is set to -6dB, indicated by an asterisk (*).

When any measurement functions are turned on (see page 111 for details), the EMI filter is automatically disabled. Conversely if the EMI filter is turned on, any measurement functions are turned off.



Operation 1. Press  > *EMI Filter[F6]* and toggle EMI filter on or off.

Sweep



The GSP-930 has a number of sweep options including setting the sweep time and sweep mode(continuous, single). The GSP-930 also has gated sweep modes.

Sweep Time

Description Sweep time defines the length of time the system takes to "sweep" the current frequency span. Note, however, that sweep time and RBW/VBW are in a trade-off. Faster sweep times update the display more frequently but make RBW and VBW wider, reducing the capability to separate signals at close frequencies.

| | |
|--------------|--|
| Operation | <ol style="list-style-type: none"> 1. Press  > <i>Sweep Time</i>[F1] and toggle the Sweep time to Auto or Man. 2. Set the sweep time for the Man mode. |
| | <div>Mode: Auto, Man</div> <div>Range: 22ms ~ 1000s (span>0Hz)</div> <div>50us ~ 1000s (span=0Hz)</div> <div>Resolution: 10us</div> |
| Display Icon | <div data-bbox="420 494 476 550"></div> <div data-bbox="509 494 983 592">The SWT icon will be displayed at the bottom of the screen when in the sweep is in manual mode.</div> |

Single Sweep

| | |
|--------------|---|
| Description | <p>The single sweep function is used to perform a single sweep. When Sweep Single is pressed the GSP-930 will perform a single sweep and then stop.</p> |
| Operation | <ol style="list-style-type: none"> 1. Press  > <i>Sweep Single</i>[F2] to put the spectrum analyzer into single sweep mode. 2. Press <i>Sweep Single</i>[F2] again to perform a single sweep. |
| Display Icon | <div data-bbox="420 1114 498 1211"></div> <div data-bbox="509 1114 993 1211">The Sweep Single icon is displayed on the right-hand side of the screen when the sweep is in single mode.</div> |





Note

You must wait for the single sweep to finish before pressing the Single Sweep key again.

If a setting is changed whilst the spectrum analyzer is still sweeping, the single sweep will immediately start over.

Continuous Sweep

| | |
|--------------|---|
| Description | The GSP-930 has two main sweeping modes: single and continuous. Use the continuous mode to have the sweep constantly updated. |
| Operation | 1. Press  > <i>Sweep Cont[F3]</i> to put the spectrum analyzer into continuous sweep mode. |
| Display Icon |  The Sweep Cont icon is displayed on the right-hand side of the screen when the sweep is in continuous mode. |



Note

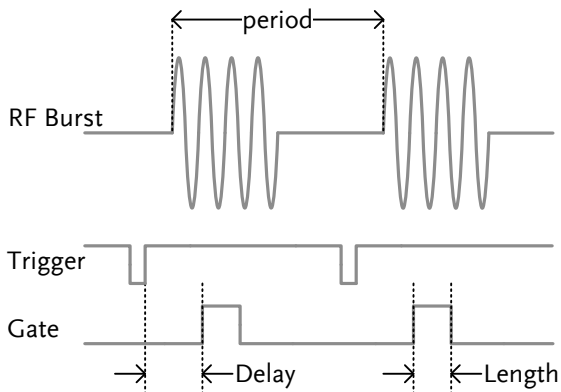
The GSP-930 will now continuously sweep unless the mode is changed to single sweep mode or if the system is waiting for a trigger condition.

Gated Sweep Overview

| | |
|-------------|---|
| Description | The Gated Sweep mode allows a trigger signal to dictate when the spectrum analyzer can sweep. This mode is useful for characterizing signals that are pulsed on and off, such as RF burst transmissions or for measuring spurious noise levels between transmission bursts. |
| Overview | <ol style="list-style-type: none"> 1. The trigger signal must be synchronized to the period of the input signal (shown as RF burst below). 2. The start of the gate time is produced from the positive or negative edge of the trigger signal + the delay time. 3. The end of the gate time is determined by the |

set gate length.

4. The gated sweep should not be positioned at either end of the transmission.



Example: The diagram above demonstrates the relationship between the input trigger, the input signal and the position of the gated sweep relative to the input signal.




Note


Please take into consideration RBW settling time. Setting the delay time too short may not leave enough time for the RBW filter to resolve.


Using the Gated Sweep Mode

- Connection
1. Connect a trigger signal (3.3v CMOS) to the GATE IN port on the rear panel.




- Operation
1. Press  > *GateDelay[F5]* and set the gate delay time.

2. Press  > *Gated Length[F6]* and set the gate time length.

3. Press  > *Gated Sweep[F4]* and turn the mode on.

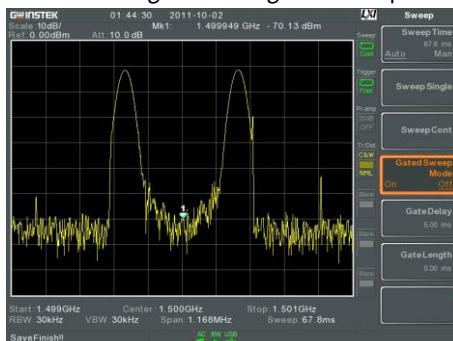
Gate Delay:0s ~ 1000s

Gate Length:10us ~ 1000s

- Display Icon
- The Sweep Gated icon is displayed when Gated Sweep is turned on.

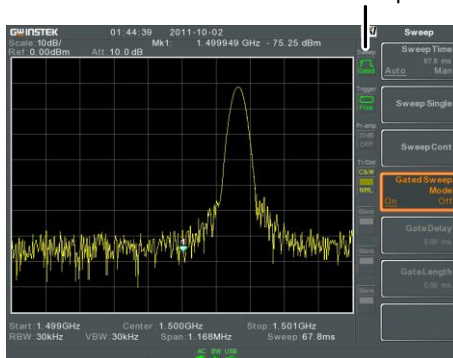
Example:

The example below shows the spectrum of an FSK modulated signal when gated sweep mode is off.



The example below shows the same signal with the gated sweep timed to sweep when only the desired frequency is output.

Gated sweep icon



Note

Gate Delay and Gate Length must first be set before Gated Sweep is turned on.

Trace

The GSP-930 is able to set the parameters of up to 4 different traces on the display at once. Each trace is represented by a different color and is updated with each sweep.

Selecting a Trace

| | |
|-------------|---|
| Description | Each trace (1, 2, 3, 4) is represented by a different color. When activated, an icon for each trace color and function is shown to the left of the display. When a trace is selected, parameters can be set/edited from the trace menu. |
|-------------|---|

| | |
|--------------|---|
| Trace Color: | 1: Yellow 2: Pink 3: Blue 4: Red |
|--------------|---|

| | |
|------------|--|
| Trace Type | The type of trace used determines how the trace data is stored or manipulated before being displayed. The analyzer updates each trace according to the type of trace used. |
|------------|--|

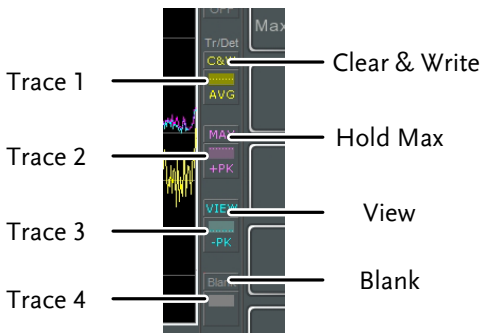
| | |
|-----------------|---|
| Clear and Write | The GSP-930 continuously updates the display with each sweep. |
|-----------------|---|

| | |
|-----------------------|--|
| Hold Max/ Hold Min | The maximum or minimum points are maintained for the selected trace. The trace points are updated each sweep if new maximum or minimum points are found. |
|-----------------------|--|


View View will hold the selected trace and stop updating the trace data for the selected trace. Pressing *View*[F4] will display the trace data that was cleared using the *Blank*[F5] key.

Blank Clears the selected trace from the display and stores trace data. The trace data can be restored by pressing *View*[F4].

Display Icon



Operation

1. Press  > *Trace*[F1] and choose the trace number.

Trace: 1, 2, 3, 4

2. Select the trace type:

Clear & Write[F2]

Max Hold[F3]

Min Hold[F4]

View[F5]

Blank[F6]




Note

Traces, 2, 3 and 4 are set to *Blank* by default.

Trace Math

| | |
|-------------|---|
| Description | Performs trace math from two traces (TR1, TR2) and stores the result in the currently selected trace. It also performs trace shift. |
|-------------|---|

| | | |
|----------------|------------|---|
| Math functions | Power Diff | Subtracts the TR1 amplitude data from the TR2 amplitude data. The TR1 data TR2 data are converted to watts. The result is converted back to dBm. |
| | Log Diff | Subtracts the TR1 amplitude data from the TR2 amplitude data and then adds a logarithmic reference. Both the TR1 and TR2 data is in dBm. The resultant trace of the subtraction is in dB. When the result is added to a logarithmic reference the resulting data is in dBm. |
| | LOG Offset | Adds a reference to the TR1 trace |

- | | |
|-----------|---|
| Operation | <ol style="list-style-type: none"> 1. Press  > <i>More[F1]>Trace Math[F1]</i>. 2. Press <i>TR1[F1]</i> and select the first trace source: <div style="display: flex; justify-content: space-between; width: 100%;"> TR1: Trace 2, Trace 3, Trace 4 </div> 3. Press <i>TR2[F2]</i> and select the second trace source: <div style="display: flex; justify-content: space-between; width: 100%;"> TR2: Trace 2, Trace 3, Trace 4 </div> |
|-----------|---|

4. Select the trace math function:

PowerDiff[F3]

LogDiff[F4]

LogOffset[F5]

5. If LogDiff was selected, set the reference level and unit.

LogDiff ref range: -120dBm ~ 30dBm

LogDiff ref units: dBm, W

6. If LogOffset was selected, set the offset level and unit.

LogOffset range: -50dB~+50dB

7. To turn trace math off, press the *OFF[F6]*.

Display Icon



The Math icon is displayed when trace math is turned on.

Trace Detection Mode

Description

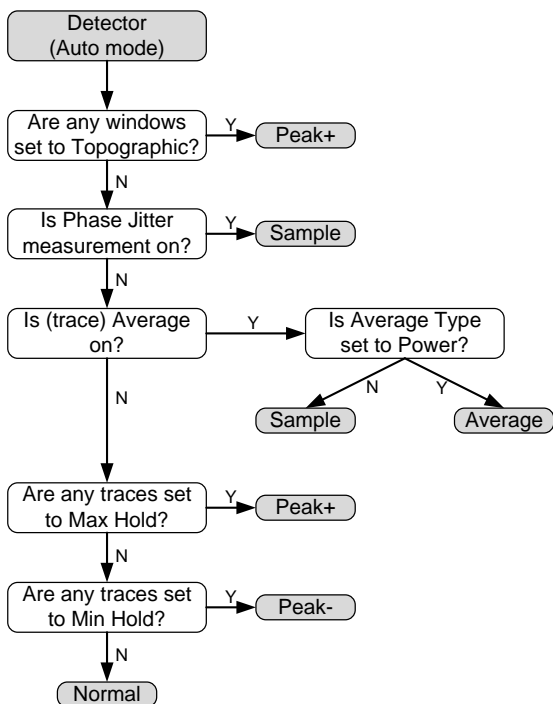
Each time the spectrum analyzer samples data for each point on the trace, a number of samples are usually taken for each point, known as a sample bucket. The actual value of each point is determined by the detector from the samples in each bucket.

Each selected trace, (1, 2, 3, 4), can use a different detection mode.

| | | |
|-----------------|---------|---|
| Detection modes | Auto | Automatically chooses an appropriate mode based on the values of all the samples. |
| | Normal | While the signal level is constantly increasing or decreasing, the positive peaks are detected. Otherwise, detecting mode switches between positive peak and negative peaks. Useful for picking up burst phenomenon while avoiding excessive noise. |
| | Peak+ | Detects positive peak signals by selecting the maximum peak value for each point from each bucket. This mode is useful for sinusoidal signals. |
| | Peak- | Detects negative peak signals by selecting the lowest peak value for each point from each bucket. This mode is not recommended for amplitude measurement. |
| | Sample | Randomly selects a value from the bucket sample. Useful for noise signals. |
| | Average | Calculates the average of all the samples in the sample bucket. |

Auto Detector Selection Method

Below is a flow chart diagram showing the Detector selection for the Auto mode.



Operation

1. Press **Trace** > More[F7]>Detection[F2].
2. Select the trace detection mode for the selected trace:

Auto[F1]
Normal[F2]
Peak+[F3]
Peak-[F4]
Sample[F5]
Average[F6]

3. The display will return the Trace menu.

Display Icon



Normal



Average icon



Peak+ icon



Peak - icon



Sample icon



Average icon

Trigger

The Trigger function sets the signal conditions upon which the spectrum analyzer triggers captured waveforms, including frequency, amplitude, and delay. An external trigger signal, instead of the default internal signal, may be used as required for special conditions.

The sections below can be used to skip to the relevant section:

- Free Run Mode → from page 79
- Activate Video Trigger → from page 79
- Activate External Trigger → from page 81
- Selecting Trigger Mode → from page 81
- Set the Trigger Delay Time → page 83

Selecting a Trigger Type


Free Run Mode

| | |
|-------------|--|
| Description | In free run mode all signals are captured and the trigger conditions are not used. |
|-------------|--|

| | |
|---------------|---|
| Free Run Mode | 1. Press  > <i>Free Run[F1]</i> to run in free mode. |
|---------------|---|

Activate Video Trigger

| | |
|-------------|---|
| Description | Sets the video trigger level for video signals. When the video signal voltage level exceeds* the video trigger level, a trigger signal will be generated. *for positive video edge |
|-------------|---|

| | | |
|------------|--|---|
| Parameters | Video Edge: | Determines the polarity of the video trigger. Positive: The signal voltage exceeds the video level at the trigger frequency. Negative: The signal voltage is lower than the video level at the trigger frequency. |
| | Video Level: | The trigger voltage level. |
| | Trigger Frequency: | Sets the frequency to start triggering |
| | | |
| Operation | 1. Press  > <i>Trigger Condition[F2]</i> > <i>Video[F1]</i> | |
| | 2. Press <i>Video Edge[F1]</i> and choose the edge. | |
| | Range: | Positive, Negative |
| | 3. Press <i>Video Level[F2]</i> and set the video voltage trigger level. | |
| | | Trigger level: (-120dBm to +30dBm) +Ref Level Offset |
| | 4. Press <i>Trigger Freq[F3]</i> and choose the frequency at which the spectrum analyzer will check the triggering conditions. | |
| | Frequency: | 0-3GHz+frequency offset |




Note

Set the trigger back to Free Run to disable the video trigger.

Activate External Trigger

Description The external trigger is used when an external trigger signal is input into the rear panel TRIG IN port. The external trigger signal can be configured as positive or negative edge.

Trigger: 3.3V, CMOS

Operation 1. Press  > *Trigger Condition*[F2] > *Ext.Edge*[F2] and select the trigger edge:

Pos: Positive edge
Neg: Negative edge

2. Connect the external trigger signal to the rear panel TRIG IN port.



3. Press *Action Now*[F5] to activate the external trigger.
4. The system will now wait the trigger conditions to be matched before starting a sweep.

Display Icon




The EXT Trigger icon is displayed when the external trigger is activated.



Note

The trigger will revert back to the Free Run mode if any parameter settings are changed, such as the span or amplitude settings.


Selecting the Trigger Mode

| | | |
|-------------|---|--|
| Description | In free run mode all signals are captured and the trigger conditions are not used. | |
| Modes | Normal: | The spectrum analyzer captures every signal that meets the trigger conditions. |
| | Single: | The spectrum analyzer captures the first signal that meets the trigger conditions. |
| | Continuous: | The spectrum analyzer captures the first signal that meets the trigger conditions then switches to free run mode thereafter. |
| Operation | <div>1. Press  > <i>Trigger Mode</i>[F3] to toggle the trigger mode:</div> <div>Nor.: Normal</div> <div>Sgl.: Single</div> <div>Cont.: Continuous</div> <div>2. Press <i>Action Now</i>[F5] to manually start triggering.</div> | |

Set the Trigger Delay Time

Description Sets the delay time between when the analyzer triggers and when the analyzer begins to capture the signal.

Delay time range: 1ns to 1ks

Operation 1. Press  > *Trigger Delay*[F4] and set the trigger delay time.

Delay range: 0~1000s

Marker

A Marker shows the frequency and amplitude of a waveform point. The GSP-930 can activate up to 6 markers or marker pairs simultaneously as well as up to 10 peak markers in the marker table.

The marker table helps editing and viewing multiple markers in a single display.

A delta marker shows the frequency and amplitude differences between the reference marker.

The GSP-930 can automatically move a marker to various locations including the peak signal, center frequency, and start/stop frequency. Other marker operations regarding signal peaks are available in the Peak Search function.

- Activating a Marker → from page 85
- Move Marker Manually → from page 86
- Move Marker to Preset Locations → from page 86
- Activate Delta Marker → from page 87
- Move Delta Marker(s)Manually → from page 88
- Marker Functions → from page 89
- Move Marker to Trace → from page 91
- Show Markers in Table → from page 92
- Peak Search → from page 93
- Peak Configuration → from page 95
- Peak Table → from page 96

Activating a Marker

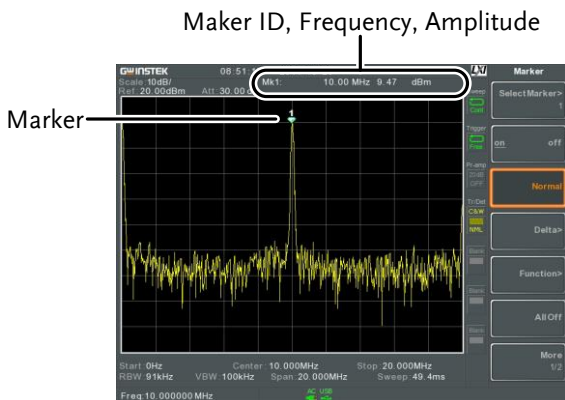
There are two basic marker types, normal markers and delta markers. Normal markers are used to measure the frequency/time or amplitude of a point on the trace. Delta markers are used to measure the difference between a reference point and a selected point on the trace.

Activate a Normal Marker

Operation




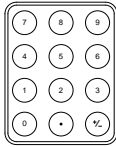
1. Press **Marker** > *Select Marker*[F1] and select a marker number.

Marker: 1~6
2. Press [F2] to turn the selected marker on.
3. Press *Normal*[F3] to set the selected marker to the Normal type.
4. The display will show the marker on the trace (centered by default) with the marker measurement at the top of the display.




Move Marker Manually

Operation

1. Press  > *Select Marker[F1]* and select a marker number.
2. Use the left/right arrow keys to move the marker one grid division. 
3. Use the scroll wheel to move the marker in fine increments. 
4. Alternatively, the numeric keypad can be used to directly enter the frequency of the marker position. 

Move Marker to Preset Locations

Description


The  key is used to move the selected marker to a number of preset positions.

Functions



Mkr>Center: Move to center frequency.
 Mkr>Start: Move to start frequency.
 Mkr>Stop: Move to stop frequency.
 Mkr>CF Step: Move to step frequency.
 Mkr>Ref Lvl: Move to reference level amplitude.



Note

When the  key is used, the span and other settings may be automatically changed.

Operation

1. Press  > *Select Marker[F1]* and select a marker number.
2. Press  and select a marker position:

Mkr>Center[F1]
Mkr>Start [F2]
Mkr>Stop[F3]
Mkr>CF Step[F4]
Mkr>Ref Lv/[F5]

Activate Delta Marker


Description Delta markers are marker pairs that measure the difference in frequency/time and amplitude between a reference marker and a delta marker.

When delta markers are activated, the reference and delta marker appear at the position of the selected marker, or in the center of the display if the selected marker has not yet be activated.

The marker measurement is located at the top of the display, under the “normal marker” measurement.



| | | |
|---------------|--------|--|
| Delta Markers | Ref: | Reference marker, designated as \downarrow . |
| | Delta: | Delta marker, designated as $\Delta\downarrow$. |

Operation

1. Press  > *Select Marker[F1]* and select a marker number.
2. Press *[F2]* to turn the selected marker on.
3. Press *Delta[F4]>Delta[F1]* to set the selected marker to the Delta type.

Move Delta Marker(s) Manually

Move Delta or
Reference Marker

1. Press  > *Delta[F4]* > *Move[F2]* > *Move Ref[F2]* to move the reference marker.
 2. Press  > *Delta[F4]* > *Move[F2]* > *Move Delta[F3]* to move the Delta marker.
 3. Move the selected marker in the same fashion as a normal marker, see page 86
-

Move Both
reference and
delta marker

1. Press either *Move Pair Span[F4]* or *Move Pair Center[F5]* to move both markers at the same time.

Move Pair Span:

Sets the frequency span between both markers. The span can be positive or negative:

$$\underset{\nabla}{1} \leftarrow +\text{span} \rightarrow \underset{\nabla}{\Delta 1}$$

$$\underset{\nabla}{\Delta 1} \leftarrow -\text{span} \rightarrow \underset{\nabla}{1}$$

Move Pair Center:

Moves both markers at the same time, keeping the span between both markers even throughout.

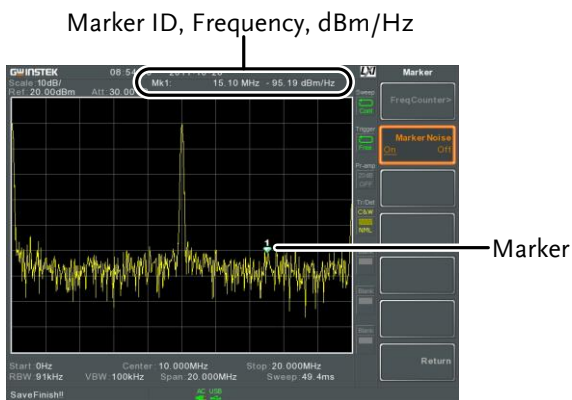
2. Move both markers in the same fashion as a normal marker, see page 86

Marker Functions


Marker Noise

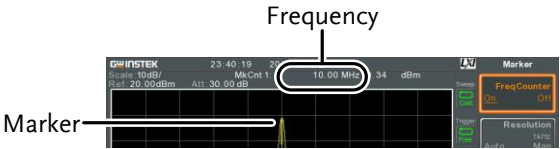
Description The noise marker function calculates the average noise level over a bandwidth of 1Hz, referenced from the marker position.

- Operation**
1. Press **Marker** > *Select Marker[F1]* and select a marker number.
 2. Press **[F2]** to turn the selected marker on.
 3. Press *Normal[F3]* and then position the marker to the desired location.
 4. Press *Function[F5]>Marker Noise* and turn Marker Noise on.
 5. The display will show the noise level measurement at the top of the screen in dBm/Hz.



Frequency Counter

| | | |
|-------------|--|--|
| Description | The frequency counter function is used to make accurate frequency measurements. | |
| Operation | <ol style="list-style-type: none">1. Press  > <i>Select Marker</i>[F1] and select a marker number.2. Press [F2] to turn the selected marker on.3. Press <i>Normal</i>[F3] and then position the marker to the desired location.4. Press <i>Function</i>[F5]><i>Frequency Counter</i>[F1] and turn the counter function on.5. Press <i>Resolution</i>[F2] and set the resolution: Auto: Automatically chooses the best resolution. Man: Allows the resolution to be manually set. Man Range: 1Hz, 10Hz, 100Hz, 1kHz6. The display will show the frequency measurement at the top of the screen at the selected resolution. | |



Move Marker to Trace

Description The Marker Trace function moves the selected marker to any of the currently active traces.

- Operation**
1. Press **Marker** > *Select Marker*[F1] and select a marker number.
 2. Press [F2] to turn the selected marker on.
 3. Press *More 1/2*[F7]>*Marker Trace*[F1] and choose a trace to move the current marker to. Only active traces can be selected.

Auto[F1]

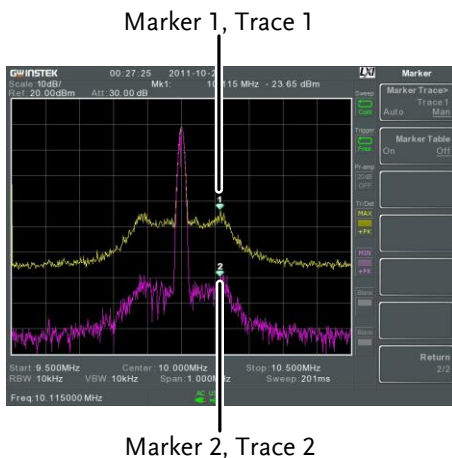
Trace1[F2]

Trace2[F3]

Trace3[F4]

Trace4[F5]

4. In the example below, marker 1 is set to Trace1 and marker 2 is set to Trace2.



Show Markers in Table

Description The GSP-930 has a Marker Table function to show all the active markers and measurements at once.





- Operation
1. Press **Marker** > *More 1/2[F7]>Marker Table[F2]* and turn the marker table on.
 2. The display will split into two screens. The bottom half will show the Marker Table with the marker ID(normal, reference or delta), trace, x-axis position (frequency/time) and the amplitude of the marker.





Marker Table

Peak Search

Move Marker to Peak

| | |
|-------------|---|
| Description | The  key is used to find trace peaks. |
| Operation | <ol style="list-style-type: none">1. Press  > <i>Select Marker[F1]</i> and select a marker number.2. Press  > <i>Peak Search[F1]</i>. The marker will move to the highest signal peak.3. To continually search for the peak each sweep, press,  > <i>More 1/2[F7]</i> > <i>Peak Track[F1]</i> and set <i>Peak Track</i> to on. |

Move Marker and Peak to Center




| | |
|-------------|--|
| Description | The Center function moves the marker to the highest signal peak and moves the center frequency to that peak. |
| Operation | <ol style="list-style-type: none">1. Press  > <i>Select Marker[F1]</i> and select a marker number.2. Press  > <i>Mkr>Center[F2]</i>. |



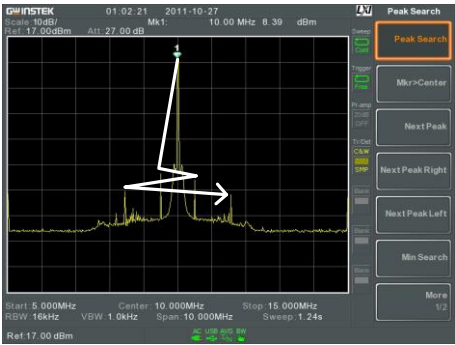
Note

The span will not be changed.

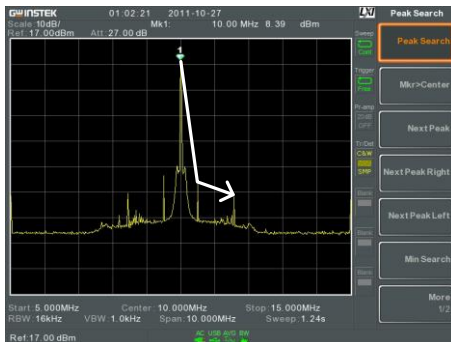
Search for Peaks

| | | |
|-------------|---|--|
| Description | The  key can be used to search for a number of different peaks. | |
| Peak Search | Next Peak: | Searches for next highest peak visible on the display. |
| | Next Peak Right: | Searches for the next peak to the right of the marker. |
| | Next Peak Left: | Searches for the next peak to the left of the marker. |
| | Min Search: | Searches for the lowest peak. |
| Operation | <ol style="list-style-type: none">1. Press  > <i>Select Marker[F1]</i> and select a marker number.2. Press  and select the type of peak you wish to find. | |

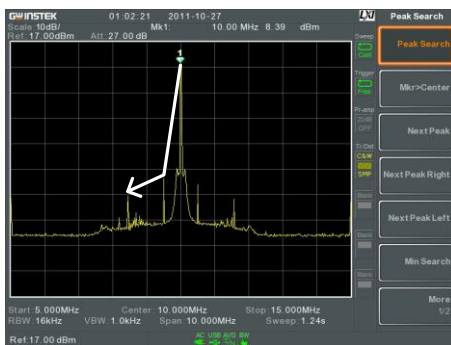
Example:
Next Peak



Example:
Next Peak Right



Example:
Next Peak Left



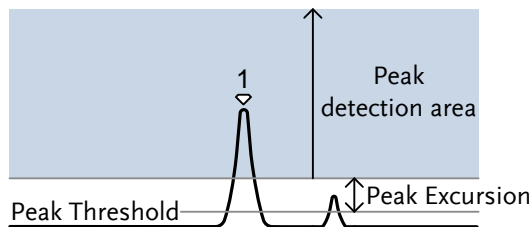
Peak Configuration

Description


There are two peak search configuration options: Peak Excursion and Peak Threshold.

Peak Excursion: Peak Excursion sets the minimum value above the peak threshold for which peaks will be detected.

Peak Threshold: Peak threshold sets the minimum threshold level for the analyzer to detect peaks. Any value above the Peak Threshold + Peak Excursion will be detected as a peak.



Operation

1. Press  >More 1/2[F7].
2. Press *Peak Excursion*[F2] to set the excursion level.
3. Press *Peak Threshold*[F3] to set the peak threshold.

Peak Excursion: 0~100dB


Peak Threshold: -120dB~+30dB

Peak Table

Description

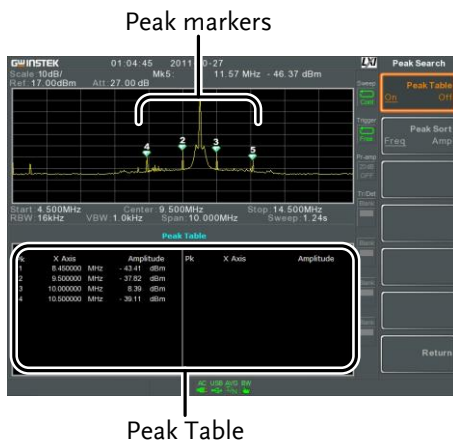
The Peak Table function will display all peaks (up to 10) that meet the peak configuration settings. The amplitude and frequency for each peak is listed.

Operation

1. Press  >More 1/2[F7]>*Peak Table*[F5].

2. Press *Peak Sort*[F2] and set the sorting type:


| | |
|-------|---------------------------------------|
| Freq: | Sort by frequency in ascending order. |
| Amp: | Sort by amplitude in ascending order. |
3. Press *Peak Table*[F1] to turn the peak table on.
4. The display splits in two. The bottom screen shows the peak table with the peak marker ID, X-axis position and amplitude.




Display

The Display key configures the basic display settings as well as setting up the display mode (spectrum, spectrographic, topographic) and the split screen modes.

Adjusting the LCD Brightness

| | | | |
|-------------|---|-------------------|--|
| Description | The LCD brightness levels can be adjusted to three pre-set levels. | | |
| Operation | 1. Press  > <i>LCD Brightness</i> [F2] to toggle the display brightness: | | |
| | Hi: | High brightness | |
| | Mid: | Medium brightness | |
| | Lo: | Low brightness | |

Turning the LCD Backlight Off

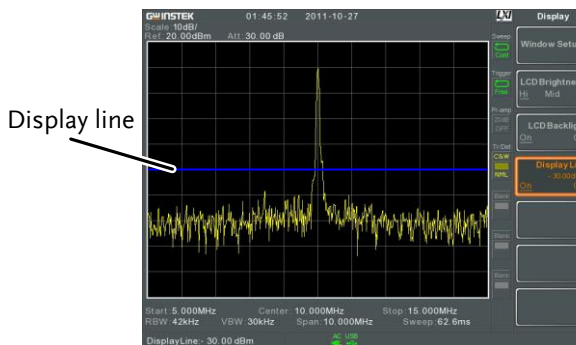
| | | | |
|-------------|--|--|--|
| Description | The LCD backlight can be turned off to preserve power or to prolong the lifetime of the LCD display when not in use. | | |
| Operation | 1. Press  > <i>LCD Backlight</i> [F3] and turn the LCD backlight off. | | |
| | 2. When the backlight is off, press any function key to turn the LCD backlight back on. | | |

Setting a Display Line (Reference Level Line)

Description The Display Line function is used to superimpose a reference level line over the traces.

- Operation**
1. Press **Display** > *Display Line*[F4] to turn the display line on.
 2. Set the display line level and unit.

Example:



Display line set at -50dBm

Using the Video Out Port

Description The GSP-930 has a dedicated DVI terminal to output the display to an external monitor. The video output is always on.

Output resolution 800 x 600 (fixed)

- Operation**
1. Connect an external monitor to the rear panel DVI terminal.


DVI - I



Setting the Display Mode

| | |
|-------------|--|
| Description | The GSP-930 has three different display modes for viewing: spectrum, spectrograph and topographic. It is also possible to view the spectrum with the spectrographic or topographic views using a split screen. |
|-------------|--|

| | |
|-------------|--|
| Spectrum | Default display mode. |
| Spectrogram | Useful for viewing frequency or power in the time domain. |
| Topographic | Useful for observing the frequency of events with a trace. |

| | |
|-----------|---|
| Operation | 1. Press  > <i>Window Setup[F1]</i> and select the display mode: |
|-----------|---|

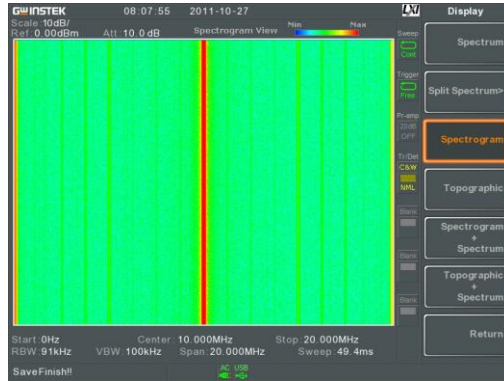
Spectrum[F1]:
Spectrogram[F3]:
Topographic[F4]:
Spectrogram+Spectrum[F5]:
Topographic+Spectrum[F6]:



Note

The same trace is used on the top and bottom for the Spectrogram+Spectrum and Topographic+Spectrum modes.

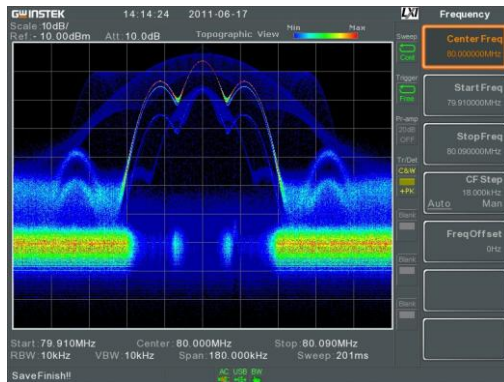
Example:
Spectrogram



The Spectrogram view shows signals in both the frequency and time domain. The X-axis represents frequency, the Y-axis represents time and the color of each point represents the amplitude at a particular frequency & time (Red = high → dark blue = low).

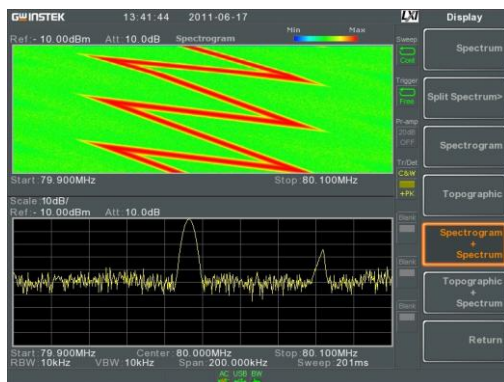
Each new trace is shown at the bottom of the display and older traces are pushed up toward the top of the display until they are removed.

Topographic



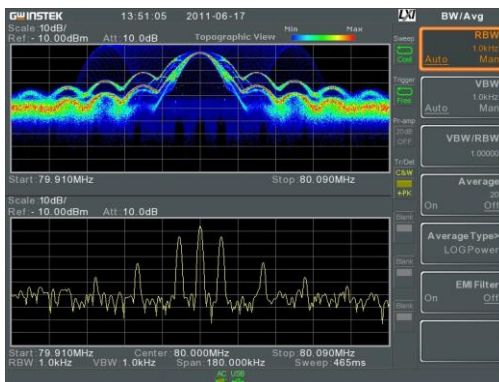
The topographic view shows the frequency of events. The topographic view is useful for observing smaller signals that have been overpowered by stronger signals or to easily observe intermittent events. Color is used to represent the frequency of an event. Red represents a high frequency of occurrence, while blue represents events that occur rarely.

Spectrogram +Spectrum



Displays both spectrographic and spectrum views of the signal.

Topographic +Spectrum



Displays both topographic and spectrum views of the signal.

Split Spectrum View

Description

The split spectrum view is able to view two different sweep ranges on the display at the same time using a split screen view. The top and bottom view can have independent sweep ranges, amplitudes, spans and other settings. However only one split screen (top or bottom) can be swept each time.

Operation

1. Press **Display** > **Window Setup[F1]** > **Split Spectrum[F2]** > **Active Win[F1]** to activate the upper split screen.
2. Pressing **Active Win.[F1]** will toggle the sweep between the upper and lower screen.
3. Press **Alternate Sweep[F2]** for the analyzer to alternate the sweep between the upper and lower screen at the end of each sweep.

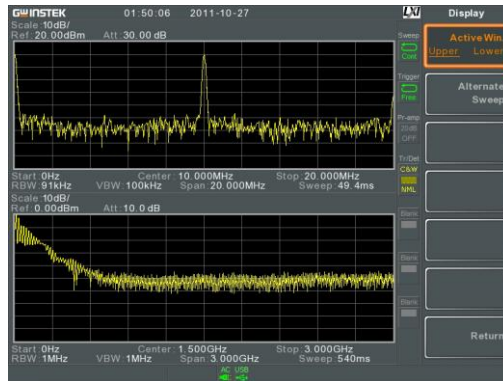


Note

No operations can be performed in alternate sweep mode.


After exiting the split spectrum view, the analyzer will use the settings from the active window. The settings for the inactive screen will be retained for the next time that split spectrum view is used.

Example:




System Settings

System Information


| | | |
|-------------|---|-------------------|
| Description | The System Information displays the following: | |
| | Serial Number | Installed Options |
| | Version: | Calibration Date: |
| | Software | LOI |
| | Firmware | RF |
| | File sys | TG |
| | RF | DNS Hostname |
| | TG | MAC Address |
| | DSP | |
| | Wordlist | |
| | Core | |
| Operation | 1. Press  > <i>System Information</i> [F1] to bring up a list of the system information. | |

Error Messages


| | | |
|-------------|--|--|
| Description | View error messages that are in the error queue by message number, description and time. All errors from the system error queue are logged when operating the analyzer. For a list of the error messages, please see the programming manual. | |
| Operation | 1. Press  > <i>Error message</i> [F2] to bring up the error message table. 2. Press <i>Prev Page</i> [F2] and <i>Next Page</i> [F3] to navigate through each page of the error list. | |

3. Press *Clear Error Queue*[F6] to clear the error messages from the list.

Set the System Language

| | |
|-------------|---|
| Description | The GSP-930 supports a number of languages. The system language sets the soft menu keys to the selected language. |
| Operation | 1. Press  > <i>Language</i> [F3] and choose the system language. |


Set the Date and Time

- Operation
1. Press  > *Date/Time*[F4].
2. Press *Set Date*[F1] to set the date:
- | | |
|-------------------|-----------------|
| <i>Year</i> [F1] | Sets the year. |
| <i>Month</i> [F2] | Sets the month. |
| <i>Day</i> [F3] | Sets the day. |
3. Press *Set Time*[F2] to set the system time:
- | | |
|--------------------|-----------------------|
| <i>Hour</i> [F1] | Sets the hour (24hr). |
| <i>Minute</i> [F2] | Sets the minute. |
| <i>Second</i> [F3] | Sets the second. |
4. The system time and date will be shown at the top of the display.



Using the Wake-Up Clock

| | |
|-------------|--|
| Description | The GSP-930 has a wake-up clock to allow the spectrum analyzer to automatically turn on at a set time. |
|-------------|--|

| | |
|-----------|--|
| Operation | 1. Press  > <i>Date/Time</i> [F4] > <i>Wake-Up Clock</i> [F3] and set the following parameters: |
|-----------|--|

| | |
|-------------------|-------------------------------|
| <i>Clock</i> [F1] | Choose a wake-up clock (1~7). |
|-------------------|-------------------------------|

| | |
|-------------------|----------------------------------|
| <i>State</i> [F2] | Turns the selected clock on/off. |
|-------------------|----------------------------------|

| | |
|------------------|----------------------|
| <i>Hour</i> [F3] | Set the wake-up hour |
|------------------|----------------------|

| | |
|--------------------|-------------------------|
| <i>Minute</i> [F4] | Set the wake-up minute. |
|--------------------|-------------------------|

| | |
|--------------------------|--|
| <i>Rept. Single</i> [F5] | Set the wake-up clock to repeat or single. |
|--------------------------|--|



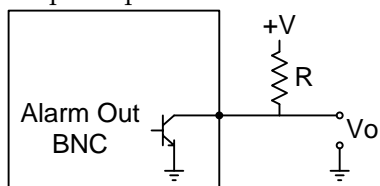
Note

Only single days can be configured for the wake-up clock.


Alarm Output

Description Allows the pass/fail output to be output via the ALARM OUT port.

Output: Open collector



Operation



1. Press  > *Alarm Output*[F6] and toggle the ALARM OUT port on or off.

Preset


The Preset function loads either factory default states or the user-defined states – depending on the Preset configuration settings.

- Using the Preset Key → from page 109
- Save the User Preset Settings → from page 109
- Preset Type Settings → from page 110
- Power on Preset Settings → from page 110



Using the Preset Key

| | |
|----------------|---|
| Description | The  key loads the factory default state or user-defined preset settings. See the Preset Type Settings on page 109 to set the type of preset settings that are loaded. |
| Factory Preset | The factory default settings are listed on page 209 |
| Operation | Press  to load the preset settings. |


Save the User Preset Settings


| | |
|-------------|--|
| Description | The user-defined preset settings can be created by saving the current state as the user-defined preset settings. |
| Operation | Press  > <i>Pwr On/Preset[F5]>Save User Preset[F3]</i> to save the current state as the <i>User Preset</i> settings. |

Preset Type Settings

| | |
|-------------|---|
| Description | Each time the  key is pressed, a set of preset configuration settings are loaded. The preset configuration settings can be either the factory default settings or the user-defined settings. |
| Operation | <div>1. Press  >Pwr On/Preset[F5]>Preset Type[2] and choose the preset type:</div> <div>User Preset[F1] Factory Preset[F2]</div> |

Power on Preset Settings

| | |
|-------------|--|
| Description | When the spectrum analyzer is turned on, either the preset configuration settings are loaded (default) or the configuration settings that were used before the instrument was turned off. |
| Operation | <div>1. Press  >Pwr On/Preset[F5]>Power On[F1] and choose the power on settings:</div> <div>Power On: Last, Preset</div> |

| | |
|--|--|
|  Note | <p>See Preset Type Settings on page 209 for details on the preset conditions.</p> <p>The last preset conditions cannot be loaded if the instrument was not powered down correctly the last time it was used. Please see page 27 for details.</p> |
|--|--|

A**ADVANCED OPERATION**

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Measurement

This section describes how to use the automatic measurement modes. The GSP-930 includes the following measurements:

- ACPR → from page 114
- OCBW → from page 117
- AM demodulation → from page 119
- FM demodulation → from page 123
- N dB measurement → page 128
- Phase Jitter→ page 129
- SEM measurement → from page 132
- TOI measurement → from page 150
- CNR/CSO/CTB measurement → from page 152

Channel Analysis Overview

| | |
|-------------|---|
| Description | Channel analysis measurement includes ACPR (adjacent channel power) and OCBW (occupied bandwidth) measurements. |
|-------------|---|

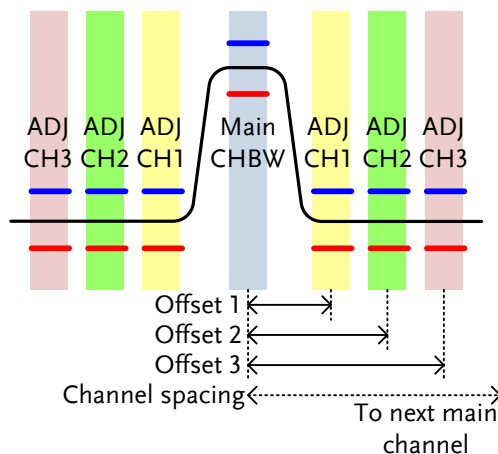
| | | |
|------------|-------------------|---|
| Parameters | Channel bandwidth | The frequency bandwidth the target channel occupies. Range: Between 0Hz~3GHz (0Hz excepted) |
| | Channel Space | The frequency distance between each main channel. Range: Between 0Hz~3GHz |

| | |
|----------------------------------|---|
| Adjacent channel bandwidth 1 & 2 | <p>The frequency bandwidth the adjacent channels occupy.</p> <p>Range: Between 0Hz~3GHz (0Hz excepted)</p> |
| Adjacent channel offset 1 ~ 3 | <p>The frequency distance between the adjacent channels and main channel.</p> <p>Range: 1 Between 0Hz~3GHz (0Hz excepted)</p> |
| OCBW% | <p>The ratio of occupied bandwidth to the amount of power consumed.</p> <p>Range: 0% to 100%, 0.1% resolution.</p> |

ACPR

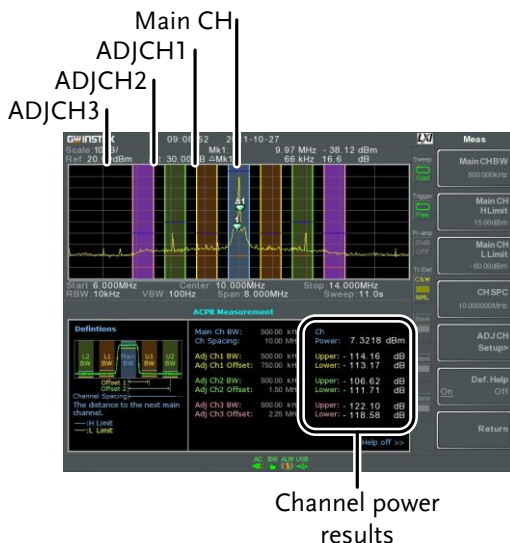
Description Adjacent channel power refers to the amount of power leaked to the adjacent channel from the main channel. This measurement is a ratio of the main channel power to power in the adjacent channel.

Example



Operation:
Setting up the
main channel

1. Press **Meas** > *Channel Analysis[F1]>ACPR[F2]* and turn ACPR on.
 - Any other measurement mode will automatically be disabled.
2. The display splits into two screens. The top screen shows the main channel, adjacent channels and their corresponding limits. The bottom screen shows the ACPR measurement results in real time.



- Press **Meas** > **Channel Analysis[F1]>ACPR Setup[F1]>** and set the following:

| | |
|----------------------------|---|
| <i>Main CHBW[F1]</i> | Set the bandwidth of the main channel. |
| <i>Main CH H Limit[F2]</i> | Set the low limit for the main channel. |
| <i>Main CH Limit[F3]</i> | Set the high limit for the main channel |
| <i>CH SPC[F4]</i> | Specify the channel spacing |

Operation:
Setting up the
adjacent
channel(s)


- Press **ADJCH Setup[F5]** to setup the adjacent channels:

| | |
|--------------------|---|
| <i>ADJCH[F1]</i> | Choose an adjacent channel number: 1, 2, 3 |
| <i>[F2]</i> | Toggle the selected channel on/off. |
| <i>ADJCHBW[F3]</i> | Choose the bandwidth of the selected channel. |

| | |
|-------------------------|--------------------------------------|
| <i>ADJCH Offset[F4]</i> | Set the adjacent channel offset. |
| <i>ADJCH HLimit[F5]</i> | Set the adjacent channel high limit. |
| <i>ADJCH LLimit[F5]</i> | Set the adjacent channel low limit. |

2. Repeat the above steps for the other adjacent channels, if needed.
-

Move Channels
Up/Down

1. Press  > *Channel Analysis[F1]* and press the following to move to another channel:

| | |
|------------------------------|------------------------|
| <i>Channel Move Up[F5]</i> | Next main channel. |
| <i>Channel Move Down[F6]</i> | Previous main channel. |



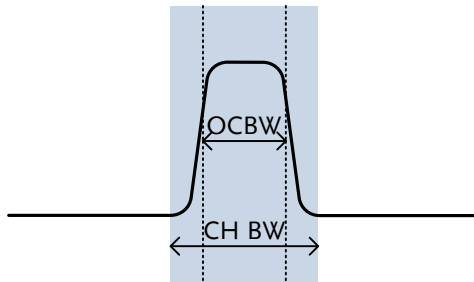
Note

The channel space (CH SPC) parameter determines where the next main channel is located.

OCBW

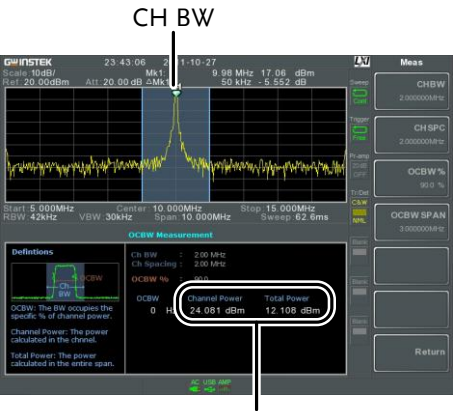
| | |
|-------------|--|
| Description | Occupied bandwidth measurements are used to measure the power of the occupied channel as a percentage to the power of the channel. |
|-------------|--|

Example



Operation:
Setting up the
main channel

1. Press **Meas** > *Channel Analysis*[F1]>*OCBW*[F4] and turn OCBW on.
 - *Any other measurement mode will automatically be disabled.*
2. The display splits into two screens. The top shows the channel bandwidth. The bottom screen shows the OCBW measurement results in real time.



Channel power and total power results

3. Press *OCBW Setup*[F3] to enter the OCBW setup:

| | |
|--------------------|--|
| <i>CHBW</i> [F1] | Set the channel bandwidth. |
| <i>CH SPC</i> [F2] | Set the channel space between main channels. |
| <i>OCBW%</i> [F3] | Set the % of the OCBW to CHBW. |

Move Channels Up/Down

1. Press Meas > *Channel Analysis*[F1] and select:
- | | |
|-------------------------------|------------------------|
| <i>Channel Move Up</i> [F5] | Next main channel. |
| <i>Channel Move Down</i> [F6] | Previous main channel. |




Note

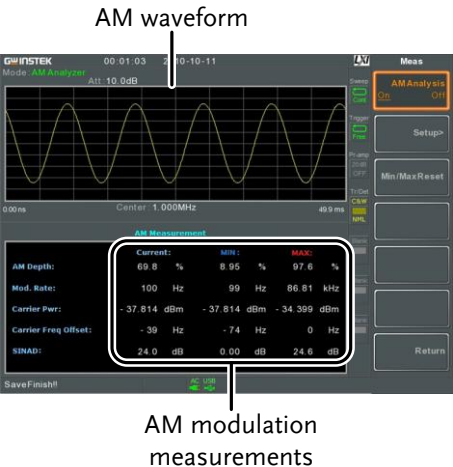
The channel space (CH SPC) parameter determines where the next main channel is located.

The CH SPC parameters from the ACPR and OCBW setups are independent.

AM/FM Analysis

AM Analysis

| | | |
|--------------------------|--|-------------------|
| Description | When amplitude modulation is turned on, the input signal is centered on the center frequency and the span is automatically set to zero-span. | |
| Measurement items | AM Depth: | Current, Min, Max |
| | Mod. Rate: | Current, Min, Max |
| | Carrier Pwr: | Current, Min, Max |
| | Carrier Freq Offset: | Current, Min, Max |
| | SINAD: | Current, Min, Max |
| Operation: configuration | <ol style="list-style-type: none"> 1. Set the center frequency to the carrier frequency (page 39). 2. Press  > Demod[F2] > AM Analysis[F1] > AM Analysis[F1] and turn AM analysis on. <ul style="list-style-type: none"> • Any other measurement mode will automatically be disabled. 3. The display splits into two screens. The top shows the AM waveform in the time domain. The bottom screen shows the AM measurement. | |



4. Press *Setup*[F2]>*IF Bandwidth*[F1] and set the Intermediate frequency bandwidth.
 - Set with adequate bandwidth to accommodate spectrum contained in the carrier.
5. Press *LPF*[F2] to set the low pass filter frequency, alternatively the frequency can be set to bypass:

| AM Signal Frequency (Hz) | | | | | | |
|----------------------------------|---------|--------|--------|--------|--------|--|
| Selectable bandwidth of LPF (Hz) | | | | | | |
| ≥78,125 | 156,250 | 78,125 | 52,083 | 39,063 | 31,250 | |
| ≥39,063 | 78,125 | 39,063 | 26,042 | 19,531 | 15,625 | |
| ≥19,531 | 39,063 | 19,531 | 13,021 | 9,766 | 7,813 | |
| ≥7,813 | 15,625 | 7,813 | 5,208 | 3,906 | 3,125 | |
| ≥3,906 | 7,813 | 3,906 | 2,604 | 1,953 | 1,563 | |
| ≥1,953 | 3,906 | 1,953 | 1,302 | 977 | 781 | |
| ≥781 | 1,563 | 781 | 521 | 391 | 313 | |
| ≥391 | 781 | 391 | 260 | 195 | 156 | |
| ≥195 | 391 | 195 | 130 | 98 | 78 | |
| ≥78 | 156 | 78 | 52 | 39 | 31 | |
| ≥39 | 78 | 39 | 26 | 20 | 16 | |
| ≥20 | 39 | 20 | 13 | 10 | 8 | |
| ≥8 | 16 | 8 | 5 | 4 | 3 | |

6. Press *Time Axis* [F3] to set horizontal axis parameters:

| | |
|-----------------------|--|
| <i>Ref. Value[F1]</i> | Sets the starting time on the time axis. |
| <i>Ref. Pos[F2]</i> | Shifts the waveform X number of grid subdivisions. |
| <i>Scale/Div[F3]</i> | Sets the grid division scale when Auto Scale is Off. |
| <i>Auto Scale[F4]</i> | Toggles auto-scaling on/off. |

7. Press *Depth Axis[F4]* to set depth (vertical) parameters:

| | |
|-----------------------|--|
| <i>Ref. Value[F1]</i> | Offsets the reference position as a percentage of the vertical scale/ div. |
| <i>Ref. Pos[F2]</i> | Sets the reference position of the waveform on a horizontal grid subdivision (1:10). |
| <i>Scale/Div[F3]</i> | Sets the horizontal grid division scale when Auto Scale is Off. |
| <i>Auto Scale[F4]</i> | Toggles auto-scaling on/off. |

Operation:
trigger
configuration


8. Press *AF Trigger[F5]* to set the triggering conditions:

| | |
|-----------------------|--|
| <i>FreeRun[F1]</i> | Disables the trigger, this is the default setting. |
| <i>Edge Slope[F2]</i> | Sets the trigger to rising or falling edge. |

| | |
|--------------------------|--|
| <i>Trigger Mode[F3]</i> | Sets the triggering mode: Nor.: Normal trigger Sgl.: Single trigger Cont.: Continuously trigger |
| <i>Trigger Level[F4]</i> | Sets the trigger level as a percentage of the depth. |
| <i>Trigger Delay[F5]</i> | Sets the trigger delay time: 0 to 1ks |
| <i>Run Now[F6]</i> | Turns FreeRun mode off and uses the user-defined trigger settings. |




Note

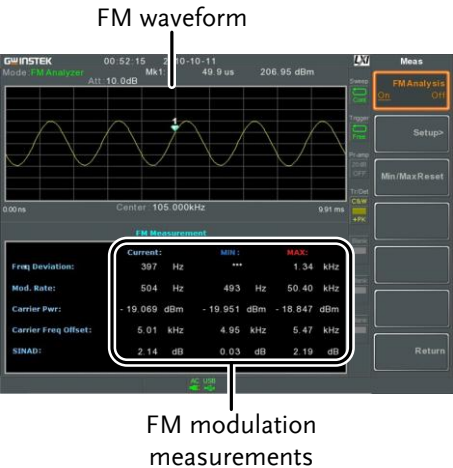
The MAX and MIN measurements are held until higher or lower values are found. To reset the MAX and MIN measurements, press  >
Demod[F2]>AM Analysis[F1]>Min/Max Reset[F3].

FM Analysis

| | |
|-------------|---|
| Description | When frequency modulation is turned on, the input signal is centered on the carrier frequency and the span is automatically set to zero-span. |
|-------------|---|

| | | |
|-------------------|----------------------|-------------------|
| Measurement items | Freq. Deviation: | Current, Min, Max |
| | Mod. Rate: | Current, Min, Max |
| | Carrier Pwr: | Current, Min, Max |
| | Carrier Freq Offset: | Current, Min, Max |
| | SINAD: | Current, Min, Max |

- Operation: configuration
1. Set the center frequency to the carrier frequency (page 39).
 2. Press  > *Demod[F2]>FM Analysis[F2]>FM Analysis[F1]* and turn FM analysis on.
 - *Any other measurement mode will automatically be disabled.*
 3. The display splits into two screens. The top shows the FM waveform in the time domain. The bottom screen shows the FM measurement.



4. Press *Setup*[F2]>*IF Bandwidth*[F1] and set the Intermediate frequency bandwidth. (10kHz, 30kHz, 100kHz, 300kHz, 1MHz,)
 - *Set with adequate bandwidth to accommodate spectrum contained in the carrier.*
5. Press *LPF*[F2] to set the low pass filter frequency, alternatively the frequency can be set to bypass:

| FM Signal Frequency (Hz) | | | | | |
|--------------------------|----------------------------------|--------|--------|--------|--------|
| | Selectable bandwidth of LPF (Hz) | | | | |
| ≥78,125 | 156,250 | 78,125 | 52,083 | 39,063 | 31,250 |
| ≥39,063 | 78,125 | 39,063 | 26,042 | 19,531 | 15,625 |
| ≥19,531 | 39,063 | 19,531 | 13,021 | 9,766 | 7,813 |
| ≥7,813 | 15,625 | 7,813 | 5,208 | 3,906 | 3,125 |
| ≥3,906 | 7,813 | 3,906 | 2,604 | 1,953 | 1,563 |
| ≥1,953 | 3,906 | 1,953 | 1,302 | 977 | 781 |
| ≥781 | 1,563 | 781 | 521 | 391 | 313 |
| ≥391 | 781 | 391 | 260 | 195 | 156 |
| ≥195 | 391 | 195 | 130 | 98 | 78 |
| ≥78 | 156 | 78 | 52 | 39 | 31 |
| ≥39 | 78 | 39 | 26 | 20 | 16 |
| ≥20 | 39 | 20 | 13 | 10 | 8 |
| ≥8 | 16 | 8 | 5 | 4 | 3 |

6. Press *Time Axis*[F3] to set horizontal axis parameters:

| | |
|------------------------|--|
| <i>Ref. Value</i> [F1] | Sets the starting time on the time axis. |
| <i>Ref. Pos</i> [F2] | Shifts the waveform X number of grid subdivisions. |
| <i>Scale/Div</i> [F3] | Sets the grid division scale when Auto Scale is Off. |
| <i>Auto Scale</i> [F4] | Toggles auto-scaling on/off. |

7. Press *Deviation Axis*[F4] to set depth (vertical) parameters:

| | |
|------------------------|--|
| <i>Ref. Value</i> [F1] | Offsets the reference position (in frequency). |
| <i>Ref. Pos</i> [F2] | Sets the reference position of the waveform on a horizontal grid subdivision (1:10). |
| <i>Scale/Div</i> [F3] | Sets the horizontal grid division scale. |
| <i>Auto Scale</i> [F4] | Toggles auto-scaling on/off. |

Operation:
trigger
configuration


8. Press *AF Trigger*[F5] to set the triggering conditions:

| | |
|------------------------|--|
| <i>FreeRun</i> [F1] | Disables the trigger, this is the default setting. |
| <i>Edge Slope</i> [F2] | Sets the trigger to rising or falling edge. |

| | |
|--------------------------|--|
| <i>Trigger Mode[F3]</i> | Sets the triggering mode: Nor.: Normal trigger Sgl.: Single trigger Cont.: Continuously trigger |
| <i>Trigger Level[F4]</i> | Sets the trigger level as a frequency. |
| <i>Trigger Delay[F5]</i> | Sets the trigger delay time: 0 to 1ks |
| <i>Run Now[F6]</i> | Turns FreeRun mode off and uses the user-defined trigger settings. |




Note


The MAX and MIN measurements are held until higher or lower values are found. To reset the MAX and MIN measurements, press  >
Demod[F2]>FM Analysis[F1]>Min/Max Reset[F3].

AM/FM Demodulation

| | |
|-------------|---|
| Description | The GSP-930 has a convenient AM/FM demodulation function to tune into AM or FM broadcast signals and listen to the demodulated baseband signals using the ear phone out socket. |
|-------------|---|

| | |
|---------------------|---|
| Operation: Setup | <ol style="list-style-type: none"> 1. Set the center frequency to the desired FM/ AM carrier frequency. See page 39 for details. 2. Set the span to zero. See page 44 for details. 3. Set the Preamp to Auto. See page 57. |
|---------------------|---|

| | |
|------------|---|
| Connection | Connect headphones or a speaker to the phone output port.  |
|------------|---|

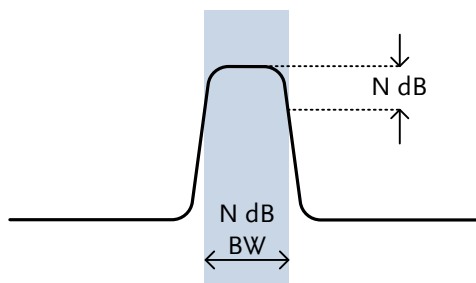
| | |
|-----------|---|
| Operation | <ol style="list-style-type: none"> 4. Press  > <i>Demod[F2]</i> > <i>Sound[F3]</i> > <i>Ear Phone Out[F1]</i> and turn the ear phone out on. 5. Press <i>Volume[F2]</i> to set the volume output: <div style="display: flex; justify-content: space-between; width: 100%;"> Volume: 0~15, default 7 </div> 6. Press <i>Digital Gain Control[F3]</i> to change the gain: <div style="display: flex; justify-content: space-between; width: 100%;"> Gain: 0~18dB, 6dB step </div> 7. Press <i>Demod Type[F4]</i> to choose AM or FM demodulation. |
|-----------|---|

N dB Bandwidth

Description

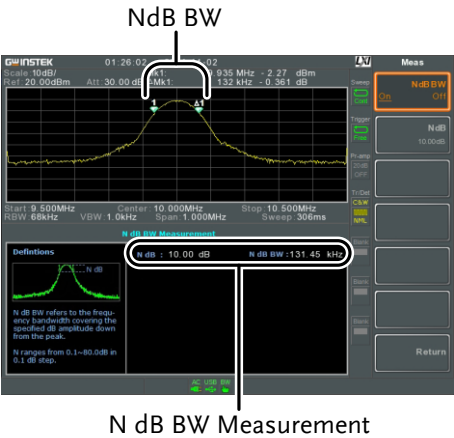
N dB bandwidth measurements are used to measure the frequency bandwidth that covers a specified amplitude (N dB) from the top of the peak.

Example



Operation

1. Press **Meas** > *NdB Bandwidth*[F3]>*NdB BW*[F1] and turn N dB BW on.
 - Any other measurement mode will automatically be disabled.
2. The display splits into two screens. The top shows the trace with markers for NdB and NdB BW. The bottom screen shows the N dB measurement results in real time.



3. Press $NdB[F2]$ to set the NdB amplitude:

Amplitude: 0.1dB ~ 80.0 dB



Note

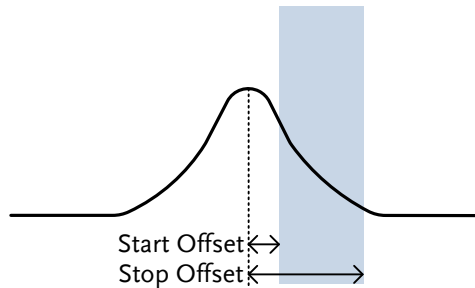
The NdB bandwidth measurements are strongly tied to the RBW and VBW.

Phase Jitter Measurement

| | | |
|-------------|--|---|
| Description | Phase Jitter refers to the amount of phase fluctuation and can be used to evaluate stability of a signal in the time domain. | |
| Parameters | Start Offset: | The start frequency with respect to the center frequency. |
| | Stop Offset: | The stop frequency with respect to the center frequency. |

| | | |
|-------------------|------------------|-----|
| Measurement items | Carrier Power: | dBm |
| | Jitter in phase: | rad |
| | Jitter in time: | ns |

Example



Operation:
Setting up the
main channel

1. Press **Meas** > *Phase Jitter*[F4]>*Phase Jitter*[F1] and turn Phase Jitter on.
 - *Any other measurement mode will automatically be disabled.*
2. The display splits into two screens. The top shows the trace with the start and stop offsets. The bottom screen shows the phase jitter measurements.



Phase jitter measurements

3. Press *Start Offset*[F2] to set the start offset:

Offset: (0Hz ~ $\frac{1}{2}$ span freq)

4. Press *Stop Offset*[F3] to set the stop offset:

Offset: (0Hz ~ $\frac{1}{2}$ span freq)



Note

The phase jitter measurements are strongly tied to the RBW and VBW.

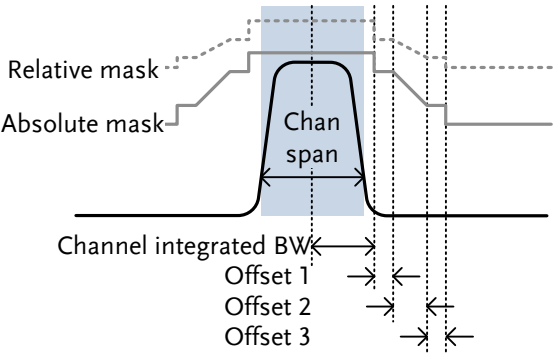
Spectrum Emission Mask Overview

Description SEM measurements are used to measure the out-of-channel emissions relative to the in-channel power. SEM measurements are usually calculated for specified power bands at a number of different offsets to the carrier frequency. SEM measurements are often carried out for a number of different wireless standards.

For 3GPP, the GSP-930 supports BS (base station) and UE (user equipment) testing standards for both FDD (frequency-division duplexing) and TDD (time-division duplexing) modes.

The GSP-930 also supports SEM testing for 802.11b, 802.11g, 802.11n and 802.16 as well as user defined emission mask testing

Example



| | | |
|-------------------|----------------------|--|
| Parameters | Chan Inte BW: | Channel Integration Bandwidth. The Chan Inte BW is used to measure the in-channel power. |
|-------------------|----------------------|--|

| | |
|------------------------|--|
| Chan Span: | Used to define the span of the main channel when measuring the channel power. |
| RBW: | Sets the resolution bandwidth for the main channel when measuring the in-channel power. |
| Total Power Reference: | The total power of the carrier that is used as the reference for calculating the offset power. |
| PSD Ref: | The mean power spectral density of the carrier that is used as the reference for calculating the offset power. |
| Select Offset: | Selects the offset pairs (1 ~ 5) used for configuration. |
| Start Freq: | Sets the start frequency offset for the selected offset number. |
| Stop Freq: | Sets the stop frequency offset for the selected offset number. |
| RBW: | Sets the resolution bandwidth of the selected offset number. |
| Abs Start: | Sets the absolute level limit at the Start Freq for selected offset number. |

| | | |
|-------------------|-------------------------------|--|
| | | |
| <hr/> | | |
| | Abs Stop: | Sets the absolute level limit at the Stop Freq for the selected offset number. The Abs Stop level limit can be set to Couple or Man. Man allows Abs Stop to be user-defined, while Couple will lock Abs Stop to the Abs Start level limit. |
| <hr/> | | |
| | Rel Start: | Sets the relative level limit at the Start Freq for the selected offset number. |
| <hr/> | | |
| | Rel Stop: | Sets the relative level limit at the Stop Freq for the selected offset number. Rel Stop can be set to Couple or Man. Man allows Rel Stop to be user-defined, while Couple will lock Rel Stop to the Rel Start level limit. |
| <hr/> | | |
| | Fail Mask: | Sets the fail conditions for measurement with regards to the level limits: Absolute, Relative, Absolute & Relative, Absolute or Relative. |
| <hr/> | | |
| Measurement items | Main Channel Bandwidth: | Unit: Hz |
| | Total Power: | Unit: dBm |
| | PSD (Power Spectral Density): | Unit: dBm/Hz |
| | <hr/> | |

Offset 1~5: Lower dBm, Upper dBm

3GPP Operating Bands*

| Operating Band | UL Frequencies UE transmit, Node B receive | DL Frequencies UE receive, Node B transmit |
|----------------|---|---|
| I | 1920~1980MHz | 2110~2170MHz |
| II | 1850~1910MHz | 1930~1990 MHz |
| II | 1710~1785MHz | 1805~1880MHz |
| IV | 1710~1755MHz | 2110~2155MHz |
| V | 824~849MHz | 869~894MHz |
| VI | 830~840MHz | 875~885MHz |
| VII | 2500~2570MHz | 2620~2690MHz |
| VIII | 880~915MHz | 925~960MHz |
| IX | 1749.9~1784.9MHz | 1844.9~1879.9MHz |
| X | 1710~1770MHz | 2110~2170MHz |
| XI | 1427.9~1452.9MHz | 1475.9~1500.9MHz |
| XII | 698~716MHz | 728~746MHz |
| XIII | 777~787MHz | 746~756MHz |
| XIV | 788~796MHz | 758~768MHz |
| XV | Reserved | Reserved |
| XVI | Reserved | Reserved |
| XVII | Reserved | Reserved |
| XVIII | Reserved | Reserved |
| XIX | 830~845MHz | 875~890MHz |
| XX | 832~862MHz | 791~821MHz |
| XXI | 1447.9~1462.9MHz | 1495.9~1510.9MHz |
| XXV | 1850~1915MHz | 1930~1995MHz |

*for FDD, referenced from ETSI:

3GPP TS 25.101 version 10.2.0 Release 10

3GPP TS 25.104 version 10.2.0 Release 10

3GPP-FDD BS For the FDD configuration, different limits can be chosen based on the total channel power, P.

The default value for Δf_{\max} is 12.5MHz. Δf_{\max} can be user-defined.

The channel span is set to 5MHz.

Note: A, B, C, D, E denote offsets 1 to 5, respectively.

| | | | |
|------------------|--------------------------------|--------------------|-------|
| $P \geq 43$ | Unit: MHz | Abs ^[1] | RBW |
| | $2.5 \leq A < 2.7$ | -14dBm | 30kHz |
| | $2.7 \leq B < 3.5$ | -14 ~ -26dBm | 30kHz |
| | $3.5 \leq C < \Delta f_{\max}$ | -13dBm | 1MHz |
| $39 \leq P < 43$ | Unit: MHz | Abs ^[1] | RBW |
| | $2.5 \leq A < 2.7$ | -15dBm | 30kHz |
| | $2.7 \leq B < 3.5$ | -14 ~ -26dBm | 30kHz |
| | $3.5 \leq C < 7.5$ | -13dBm | 1MHz |
| $31 \leq P < 39$ | Unit: MHz | Abs ^[1] | RBW |
| | $2.5 \leq A < 2.7$ | P-53dB | 30kHz |
| | $2.7 \leq B < 3.5$ | P-53dB~ P-56dB | 30kHz |
| | $3.5 \leq C < 7.5$ | P-52dB | 1MHz |
| $P < 31$ | Unit: MHz | Abs ^[1] | RBW |
| | $2.5 \leq A < 2.7$ | -22dBm | 30kHz |
| | $2.7 \leq B < 3.5$ | -22 ~ -34dBm | 30kHz |
| | $3.5 \leq C < 7.5$ | -21dBm | 1MHz |
| | $7.5 \leq D < \Delta f_{\max}$ | -25dBm | 1MHz |

For $P < 31$, two additional power limits (shown below) can be selected via the *Additional Max Out. Pwr* option for Home BS applications:

(The default value for Δf_{\max} is 14.5 MHz. Δf_{\max} can be user-defined)

| | | | |
|--------------------|---------------------------------|--------------------|------|
| $6 \leq P \leq 20$ | Unit: MHz | Abs ^[1] | RBW |
| | $12.5 \leq E < \Delta f_{\max}$ | P- 56dB | 1MHz |
| $P < 6$ | Unit: MHz | Abs ^[1] | RBW |
| | $12.5 \leq E < \Delta f_{\max}$ | -50dBm | 1MHz |

3GPP-FDD BS Additional Requirements

For operation in bands II, IV, V, X, XII, XIII, XIV and XXV, additional requirements (listed below) apply in addition to the minimum requirements listed above.

| | | | |
|--------------------------|--------------------------------|---------------------------|--------|
| Bands: II, IV, X | Unit: MHz | Additional ^[3] | RBW |
| | $2.5 \leq A < 3.5$ | -15dBm | 30kHz |
| | $3.5 \leq B < \Delta f_{\max}$ | -13dBm | 1MHz |
| Bands: V | Unit: MHz | Additional ^[3] | RBW |
| | $2.5 \leq A < 3.5$ | -15dBm | 30kHz |
| | $3.5 \leq B < \Delta f_{\max}$ | -13dBm | 100kHz |
| Bands: XII, XIII, XIV | Unit: MHz | Additional ^[3] | RBW |
| | $2.5 \leq A < 3.5$ | -13dBm | 30kHz |
| | $3.5 \leq B < \Delta f_{\max}$ | -13dBm | 100kHz |

3GPP-FDD UE

The channel span is set to 5MHz.

Note: A, B, C, D, E denote offsets 1 to 5, respectively.

| | | | |
|---------------------|------------|--------------------|-------|
| Unit: MHz | Rel | Abs ^[1] | RBW |
| $2.5 \leq A < 3.5$ | -35~-50dBc | -71.1dBm | 30kHz |
| $3.5 \leq B < 7.5$ | -35~-39dBc | -55.8dBm | 1MHz |
| $7.5 \leq C < 8.5$ | -39~-49dBc | -55.8dBm | 1MHz |
| $8.5 \leq D < 12.5$ | -49~-49dBc | -55.8dBm | 1MHz |

| | | | | |
|---|--|---------------------|---------------------------|--------|
| 3GPP-FDD UE Additional Requirements | Additional requirements for 3GPP-FDD UE. | | | |
| | Bands II, IV, X | Unit: MHz | Additional ^[3] | RBW |
| | | $2.5 \leq A < 3.5$ | -15dBm | 30kHz |
| | | $3.5 \leq B < 12.5$ | -15dBm | 1MHz |
| | Band V | Unit: MHz | Additional ^[3] | RBW |
| | | $2.5 \leq A < 3.5$ | -15dBm | 30kHz |
| | | $3.5 \leq B < 12.5$ | -13dBm | 100kHz |
| | Bands XII, XIII, XIV | Unit: MHz | Additional ^[3] | RBW |
| | | $2.5 \leq A < 3.5$ | -13dBm | 30kHz |
| | | $3.5 \leq B < 12.5$ | -13dBm | 100kHz |

3GPP-TDD BS
3.84Mcps*

For the TDD configuration, different limits can be chosen based on the total channel power,

The channel span:
3.84Mcps: 5MHz.

Note: A, B, C, D, E denote offsets 1 to 5, respectively.

| | | | |
|------------------|--------------------|--------------------|-------|
| $P \geq 43$ | Unit: MHz | Abs ^[1] | RBW |
| | $2.5 \leq A < 2.7$ | -14dBm | 30kHz |
| | $2.7 \leq B < 3.5$ | -14 ~ -26dBm | 30kHz |
| | $3.5 \leq C < 12$ | -13dBm | 1MHz |
| $39 \leq P < 43$ | Unit: MHz | Abs ^[1] | RBW |
| | $2.5 \leq A < 2.7$ | -14dBm | 30kHz |
| | $2.7 \leq B < 3.5$ | -14 ~ -26dBm | 30kHz |
| | $3.5 \leq C < 7.5$ | -13dBm | 1MHz |
| | $7.5 \leq D < 12$ | P-56dB | 1MHz |

| | | | |
|------------------|--------------------|--------------------|-------|
| $31 \leq P < 39$ | Unit: MHz | Abs ^[1] | RBW |
| | $2.5 \leq A < 2.7$ | P-53dBm | 30kHz |
| | $2.7 \leq B < 3.5$ | P-53~P-65dBm | 30kHz |
| | $3.5 \leq C < 7.5$ | P-52dBm | 1MHz |
| | $7.5 \leq C < 12$ | P-56dBm | 1MHz |
| $P \leq 31$ | Unit: MHz | Abs ^[1] | RBW |
| | $2.5 \leq A < 2.7$ | -22dBm | 30kHz |
| | $2.7 \leq B < 3.5$ | -22 ~ -34dBm | 30kHz |
| | $3.5 \leq C < 7.5$ | -21dBm | 1MHz |
| | $7.5 \leq D < 12$ | -25dBm | 1MHz |

*referenced from ETSI:

3GPP TS 25.102 version 10.2.0 Release 10

3GPP TS 25.105 version 10.3.0 Release 10

3GPP-TDD BS
1.28Mcps

The channel span:
1.28Mcps: 1.6MHz.

| | | | |
|------------------|--------------------|--------------------|-------|
| $P \geq 34$ | Unit: MHz | Abs ^[1] | RBW |
| | $0.8 \leq A < 1$ | -20dBm | 30kHz |
| | $1 \leq B < 1.8$ | -20 ~ -28dBm | 30kHz |
| | $1.8 \leq C < 3.5$ | -13dBm | 1MHz |
| $26 \leq P < 34$ | Unit: MHz | Abs ^[1] | RBW |
| | $0.8 \leq A < 1$ | P-54dB | 30kHz |
| | $1 \leq B < 1.8$ | P-54~P-62dB | 30kHz |
| | $1.8 \leq C < 3.5$ | P-47dB | 1MHz |
| $P < 26$ | Unit: MHz | Abs ^[1] | RBW |
| | $0.8 \leq A < 1$ | -28dBm | 30kHz |
| | $1 \leq B < 1.8$ | -28~-36dBm | 30kHz |
| | $1.8 \leq C < 3.5$ | -21dBm | 1MHz |

3GPP-TDD BS
7.68 Mcps

The channel span:
7.68Mcps: 10MHz.

| | | | |
|----------------|-------------------------|--------------------|-------|
| P \geq 43 | Unit: MHz | Abs ^[1] | RBW |
| | 5 \leq A<5.2 | -17dBm | 30kHz |
| | 5.2 \leq B<6 | -17 ~ -29dBm | 30kHz |
| | 6 \leq C<24.5 | -16dBm | 1MHz |
| 39 \leq P<43 | Unit: MHz | Abs ^[1] | RBW |
| | 5 \leq A<5.2 | -17dBm | 30kHz |
| | 5.2 \leq B<6 | -17 ~ -29dBm | 30kHz |
| | 6 \leq C<15 | -16dBm | 1MHz |
| 31 \leq P<39 | Unit: MHz | Abs ^[1] | RBW |
| | 5 \leq A<5.2 | P-56dB | 30kHz |
| | 5.2 \leq B<6 | P-56~P-68dB | 30kHz |
| | 6 \leq C<15 | P-55dB | 1MHz |
| P<31 | Unit: MHz | Abs ^[1] | RBW |
| | 5 \leq A<5.2 | -25dBm | 30kHz |
| | 5.2 \leq B<6 | -25~-37dBm | 30kHz |
| | 6 \leq C<15 | -24dBm | 1MHz |
| | 15 \leq D \leq 24.5 | -28dBm | 1MHz |

3GPP-TDD UE The channel span:
 3.84Mcps: 5MHz.
 1.28Mcps: 1.6MHz.
 7.68Mcps: 10MHz.

Note: A, B, C, D, E denote offsets 1 to 5, respectively.

| | | | |
|----------|---------------------|--------------------|-------|
| 3.84Mcps | Unit: MHz | Rel ^[2] | RBW |
| | $2.5 \leq A < 3.5$ | -35~-50dBc | 30kHz |
| | $3.5 \leq B < 7.5$ | -35 ~ -39dBc | 1MHz |
| | $7.5 \leq C < 8.5$ | -39~-49dBc | 1MHz |
| 1.28Mcps | $8.5 \leq D < 12.5$ | -49dBc | 1MHz |
| | Unit: MHz | Rel ^[2] | RBW |
| | $0.8 \leq A < 1.8$ | -35~-49dBc | 30kHz |
| | $1.8 \leq B < 2.4$ | -49~-59.2dBc | 30kHz |
| 7.68Mcps | $2.4 \leq C < 4$ | -44dBc | 1MHz |
| | Unit: MHz | Rel ^[2] | RBW |
| | $5 \leq A < 5.75$ | -38~-46dBc | 30kHz |
| | $5.75 \leq B < 7$ | -46 ~ -53dBc | 30kHz |
| | $7 \leq C < 15$ | -38~-42dBc | 1MHz |
| | $15 \leq D < 17$ | -42~-52dBc | 1MHz |
| | $17 \leq E < 25$ | -53dBc | 1MHz |

802.11b* The channel span: 22MHz

Note: A, B denotes offsets 1 and offset 2.
 Here the default value of “f” is 24MHz. This can be user-defined.

| | | |
|------------------|--------------------|--------|
| Unit: MHz | Rel ^[2] | RBW |
| $11 \leq A < 22$ | -30dBc | 100kHz |
| $22 \leq B < f$ | -50dBc | 100kHz |

*reference: IEEE Std 802.11b-1999

802.11g

The channel span:

ERP-OFDM/DSSS-OFDM : 18MHz

ERP-DSSS/ERP-PBCC/ERP-CCK: 22MHz

Note: A, B, C, D denote offsets 1 to 4, respectively.

Here the default value of “f” is 40MHz (ERP-OFDM/ DSSS-OFDM) or 25MHz (ERP-DSSS/ ERP-PBCC/ ERP-CCK). This can be user-defined.

| | Unit: MHz | Rel ^[2] | RBW |
|-----------------------------------|------------------|--------------------|--------|
| ERP-OFDM/ DSSS- OFDM | $9 \leq A < 11$ | -0~-20dBc | 100kHz |
| | $11 \leq B < 20$ | -20~-28dBc | 100kHz |
| | $20 \leq C < 30$ | -28~-40dBc | 100kHz |
| | $30 \leq D < f$ | -40dBc | 100kHz |
| | Unit: MHz | Rel ^[2] | RBW |
| ERP-DSSS/ ERP-PBCC/ ERP-CCK | $11 \leq A < 22$ | -30dBc | 100kHz |
| | $22 \leq B < f$ | -50dBc | 100kHz |

*reference: IEEE Std 802.11a-1999

802.11n

The channel span:

CH BW 20MHz: 18MHz

CH BW 40MHz: 38MHz

Note: A, B, C, D denote offsets 1 to 4, respectively.

Here the default value of “f” is 40MHz(CHBW 20MHz) or 70MHz(CHBW 40MHz). This can be user-defined.

| | Unit: MHz | Rel ^[2] | RBW |
|----------------|------------------|--------------------|--------|
| CH BW 20MHz | $9 \leq A < 11$ | -0~-20dBc | 100kHz |
| | $11 \leq B < 20$ | -20~-28dBc | 100kHz |
| | $20 \leq C < 30$ | -28~-45dBc | 100kHz |
| | $30 \leq D < f$ | -45dBc | 100kHz |

| | Unit: MHz | Rel ^[2] | RBW |
|----------------------------------|------------------|--------------------|--------|
| CH BW 40MHz | $19 \leq A < 21$ | 0~-20dBc | 100kHz |
| | $21 \leq B < 40$ | -20~-28dBc | 100kHz |
| | $40 \leq C < 60$ | -28~-45dBc | 100kHz |
| | $60 \leq D < f$ | -45dBc | 100kHz |
| *reference: IEEE Std 802.1n-2009 | | | |

802.16* The channel span:
 CH BW 20MHz: 19MHz
 CH BW 10MHz: 9.5MHz

Note: A, B, C, D denote offsets 1 to 4, respectively.
 Here the default value of “f” is 16.75MHz(CHBW 20MHz) or 31.5MHz(CHBW 10MHz). This can be user-defined.

| | Unit: MHz | Rel ^[2] | RBW |
|----------------|-----------------------|--------------------|--------|
| CH BW 20MHz | $9.5 \leq A < 10.9$ | 0~-25dBc | 100kHz |
| | $10.9 \leq B < 19.5$ | -25~-32dBc | 100kHz |
| | $19.5 \leq C < 29.5$ | -32~-50dBc | 100kHz |
| | $29.5 \leq D < f$ | -50dBc | 100kHz |
| | Unit: MHz | Rel ^[2] | RBW |
| CH BW 10MHz | $4.75 \leq A < 5.45$ | 0~-25dBc | 100kHz |
| | $5.45 \leq B < 9.75$ | -25~-32dBc | 100kHz |
| | $9.75 \leq C < 14.75$ | -32~-50dBc | 100kHz |
| | $14.75 \leq D < f$ | -50dBc | 100kHz |

*reference: IEEE Std 802.16-2009



Note

^[1] Abs: Absolute limit

^[2] Rel: Relative limit(to the total power or the power spectral density, depending on the compliance of the main channel)

^[3] Additional: Additional absolute limit

Pass Fail Criteria:


Case 1: When both Abs and Rel are used, the

highest value (Abs or Rel) is used as the Pass/Fail judgment. The trace points under the limit indicate a pass.

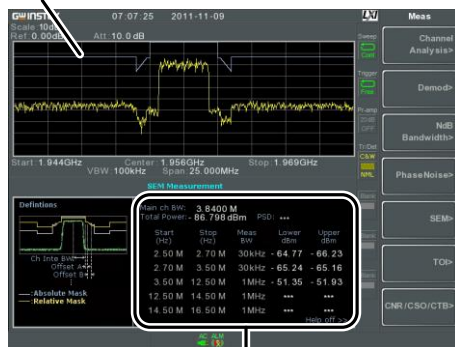
Case2: If the additional limit is used, the higher value from case1 is compared to the additional limit. The lowest one is used as the pass/fail judgment.

Spectrum Emission Mask Testing

Description For spectrum emission mask testing, the GSP-930 has pre-defined testing parameters for 3GPP, 802.11x and 802.16. The GSP-930 also allows you to perform user-defined SEM testing.

- Operation:**
1. Press  > SEM[F5]>SEM[F2] and turn SEM on.
 - Any other measurement mode will automatically be disabled.
 2. The display splits into two screens. The top shows the trace with the absolute and or relative masks. The bottom screen shows the SEM measurement results.

Absolute
limit line



SEM measurements

User Defined
Parameters

1. Press *Setup*[F1]>*User Define*[F6] to set SEM measurement to user defined parameters.

2. Press *Meas Type*[F1] choose between *TotalPwrRef*[F1] or *PSDRef*[F2].

3. Press *Ref. Channel*[F2] and set the following:

| | |
|--|---|
| <i>ChanIntegBW</i> [F1] | Sets the channel integration bandwidth. |
| <i>Chan Span</i> [F2] | Sets the channel span |
| <i>RBW</i> [F3] | Sets the resolution bandwidth. |
| <i>TotalPwrRef</i> [F4]/ <i>PSDRef</i> [F4] | Sets the total power/PSD reference level. |

4. Press *Return*[F7] to return the previous menu.

5. Press *Offset/Limit*[F3] to set the offset parameters:

| | |
|--------------------------|--|
| <i>SelectOffset</i> [F1] | Select which offset to edit. |
| [F2] | Toggles the selected offset on/off. |
| <i>StartFreq</i> [F3] | Sets the start frequency of the selected offset. |
| <i>StopFreq</i> [F4] | Sets the Stop Frequency of the selected offset. |
| <i>RBW</i> [F5] | Sets the RBW of the selected offset. |

6. Press *More 1/2*[F6] to set absolute and relative level limits and conditions:

| | |
|-----------------------|--|
| <i>Abs Start</i> [F2] | Sets the absolute start level limit for the selected offset. |
| <i>Abs Stop</i> [F3] | Sets the absolute stop level limit for the selected offset. |
| | Man: Allows a user-defined Abs Stop level |
| | Couple: Sets the Abs Stop level to the Abs Start level. |
| <i>Rel Start</i> [F4] | Sets the relative start level limit for the selected offset. |

| | |
|---------------------|--|
| <i>Rel Stop[F5]</i> | Sets the relative stop level for the selected offset. Man: Allows a user-defined Abs Stop level. Couple: Sets the Rel Stop level to the Rel Start level. |
|---------------------|--|

7. Press *Fail Mask[F6]* to set the Fail Mask conditions:

| | |
|------------------------|--|
| <i>Absolute[F1]</i> | Sets the fail condition to the Absolute level limit. |
| <i>Relative[F2]</i> | Sets the fail condition to the relative level limit. |
| <i>Abs AND Rel[F3]</i> | Sets the fail condition as both the absolute and relative level limits. |
| <i>Abs OR Rel[F4]</i> | Sets the fail condition to either the absolute or relative level limits. |

8. Press *Select Offset[F1]* and repeat the above steps for any other offsets.

| | |
|---------|-----|
| Offset: | 1~5 |
|---------|-----|

| | |
|----------------------------------|--|
| Pre-Set Test Parameters: 3GPP | For details on 3GPP SEM test parameters, please see the SEM overview on page 132. 1. Press <i>Setup[F1]>3GPP[F1]</i> to choose 3GPP measurement. |
|----------------------------------|--|

2. Press *Ref. Channel*[F2] and set the following:

| | |
|-----------------|--------------------------------|
| <i>RBW</i> [F3] | Sets the resolution bandwidth. |
|-----------------|--------------------------------|

3. All other reference channel settings are pre-defined.
4. Press *Return*[F7] to return the previous menu.
5. Press *Offset/Limit*[F3]>*Duplexing Mode*[F1] and choose FDD or TDD duplexing:
6. For FDD, press *FDD Setup*[F2] set the FDD parameters, for TDD, press *TDD Setup*[F3]:

| | |
|--------------------------|-----------------------------------|
| <i>Transmission</i> [F1] | Toggles between BS and UE testing |
|--------------------------|-----------------------------------|

| | |
|-----------------------|---|
| <i>Chip Rate</i> [F2] | Selects the bandwidth of the RRC filter that is used to measure the in-channel power for TDD duplexing: 3.84MHz, 1.28MHz, 7.68MHz |
|-----------------------|---|

| | |
|----------------------------|--|
| <i>Max Out Pwr</i> [F2/F3] | Sets the maximum output power for BS tests: P>=43 39<=P<=43 31<=P<=39 P<31 |
|----------------------------|--|

| | |
|---------------------------------------|---|
| <i>Add.limits[F4]</i> | <p>Selects the operating bands for FDD duplexing:</p> <p>None</p> <p>BandII</p> <p>BandIV</p> <p>BandV</p> <p>BandX</p> <p>BandX11</p> <p>BandXIII</p> <p>BandXIV</p> |
| <i>MinOffset/ Limit Value[F5]</i> | <p>Allows you to view the parameters of each of the offsets, including start/stop frequency, RBW, Abs Start/Stop and Rel Start/Stop.</p> |

Pre-Set Test
Parameters:
802.XX

For details on 802.11x and 802.16 SEM test parameters, please see the SEM overview on page 132

1. Press *Setup[F1]*>and choose a 802.XX test:

802.11b[F2]

802.11g[F3]

802.11n[F4]

802.16[F5]

2. Press *Ref. Channel[F2]* to view the predefined settings for channel integrated bandwidth, channel span, RBW and PSD ref.
 3. Press *Offset/Limit[F3]* to view the parameter values of each of the offsets, including Start and Stop Frequency, RBW, Rel Start and Stop
-

Third Order Intermodulation Distortion (TOI)

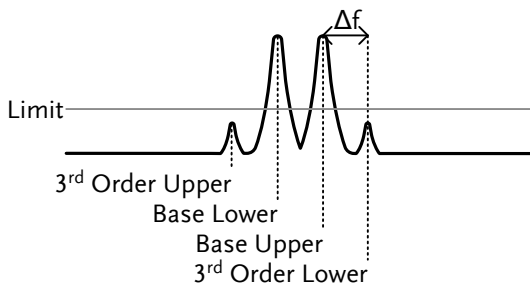
Description Third order intermodulation distortion measurement is used to calculate the TOI products caused by two signals that are close together in frequency in a non-linear system. Both the upper and lower third order intercept points (IP3) are calculated. Markers are placed at the frequencies of the TOI products and their respective base signals.

Limits can be placed on the upper and lower TOI products for limit testing.

| | | |
|-------------------|-----------------|---|
| Parameters | Reference Lower | Sets the reference level to lowest base signal. |
| | Reference Upper | Set the reference level to the highest base signal. |
| | Limit | Sets the limit in dBm for pass/fail testing |
| | Pass/Fail Test | Enables/disables pass/fail testing. |

| | | |
|--------------------------|-----------------------------|---|
| Measurement items | Base Upper | Frequency, dBm, dBc. |
| | Base Lower | Frequency, dBm, dBc |
| | 3 rd Order Lower | Frequency, dBm, dBc, limit, Intercept point |
| | 3 rd Order Upper | Frequency, dBm, dBc, limit, Intercept point |
| | Δf | Frequency |

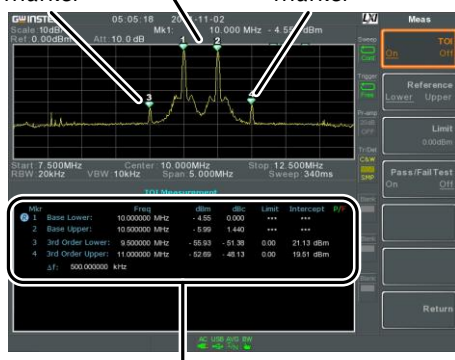
Example



Operation:

1. Press **Meas** > **TOI[F6]>TOI[F1]** and turn TOI on.
 - Any other measurement mode will automatically be disabled.
2. The display splits into two screens. The top shows the trace with markers in the upper and lower base frequencies and the upper and lower 3rd order intermodulation products. The bottom screen shows the TOI measurements and pass/fail results.

3rd Order Lower and 3rd Order
lower upper base upper
marker marker



TOI measurement and results

3. Press *Reference*[F2] to set the reference to the upper or lower base frequencies.
4. Press *Limit*[F3] and set the limit for the upper and lower 3rd order intermodulation product amplitude.
5. Press *Pass/Fail Test*[F4] to toggle pass/fail testing on/off.

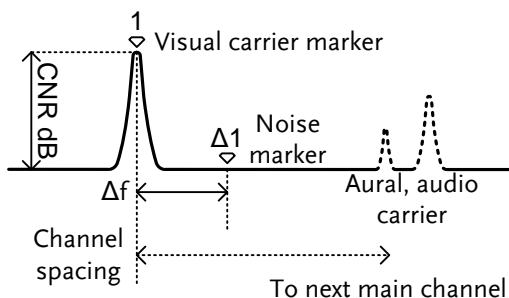
CNR/CSO/CTB Measurement

Carrier to Noise Ratio (CNR)

| | | |
|-------------|---|--|
| Description | Carrier to noise ratio calculates the difference in amplitude between the carrier signal and the noise level present in the transmission. CNR measurements are used for both analog and digital CATV. | |
| Parameters | Noise Marking | <p>Sets the position of the delta marker ($\Delta 1$) using two options:</p> <p>MIN: The delta marker will search for the minimum between the carrier frequency and the carrier frequency + 4MHz.</p> <p>ΔMarker: User defined delta marker position.</p> |

| | | |
|-------------------|----------------|---|
| Measurement items | Visual Carrier | frequency, amplitude |
| | CNR | amplitude difference |
| | Δf | frequency difference between visual carrier and noise marker. |

Example

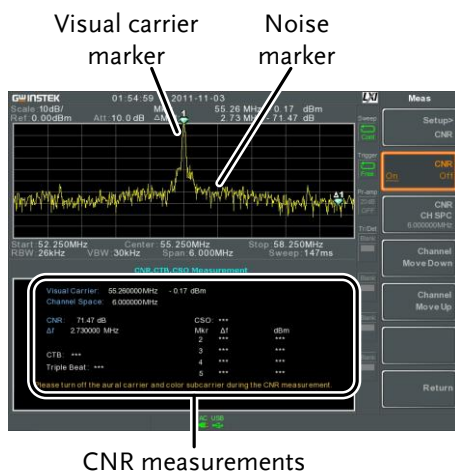


Operation:

1. Press **Meas** > **CNR/CSO/CTB[F7]** > **Setup[F1]** > **CNR[F1]** to choose CNR measurement.
 2. Press **Noise Marking[F1]** and toggle the noise marker type between Min and Δ Marker.
 3. If Min was selected, press **Return[F7]** to return to the previous menu.
 4. If Δ Marker was selected, press **Marker** > **Delta[F4]** > **Delta[F1]** and set the delta marker position.
- See page 86 for details on moving markers.

Press **Meas** > **CNR/CSO/CTB[F7]** to return to the previous menu.

5. Press **CNR[F2]** and turn CNR on.
 - Any other measurement mode will automatically be disabled.
 - Ensure the aural and color subcarriers are disabled before CNR is turned on.
6. The display splits into two screens. The top shows the trace with the visual carrier marker and the noise marker. The bottom screen shows the CNR measurements.



7. Press **CNR CH SP[F2]** to set the channel space.

Range: 0~3GHz

8. Press **Channel Move Down[F4]** or **Channel Move Up[F5]** to move to the next or previous channel.



Note

Ensure the aural and color subcarriers are turned off when making CNR measurements.

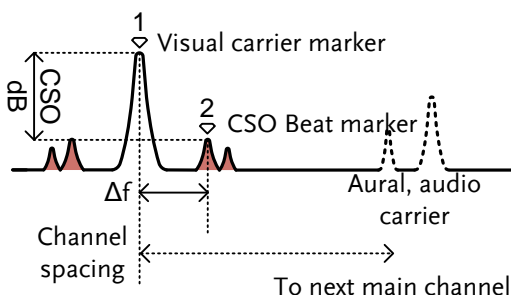
Composite Second Order (CSO)

Description Composite Second Order measurement calculates the difference in amplitude between the carrier signal and the composite second order beat.

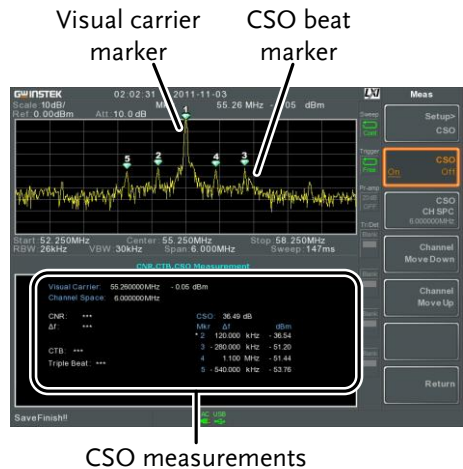
Parameters CSO CH SP: The channel space.

Measurement items Visual Carrier: frequency, amplitude
Channel Space: frequency
CSO: amplitude difference

Example



- Operation:**
1. Press Meas > CNR/CSO/CTB[F7] > Setup[F1] > CSO[F2] and choose CSO.
 2. Press CSO[F2] and toggle CSO on.
 - Any other measurement mode will automatically be disabled.
 3. The display splits into two screens. The top shows the trace with the visual carrier marker and the CSO beat marker. The bottom screen shows the CSO measurements.

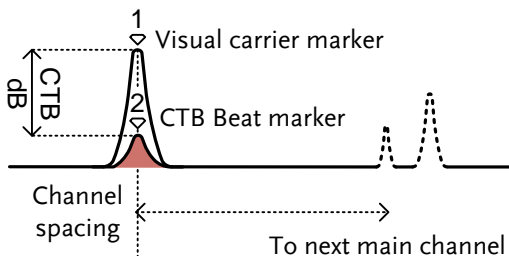


4. Press *CSO CH SP[F2]* to set the channel space.
- Range: 0~3GHz
5. Press *Channel Move Down[F4]* or *Channel Move Up [F5]* to move to next or previous channel.

Composite Triple Beat (CTB)

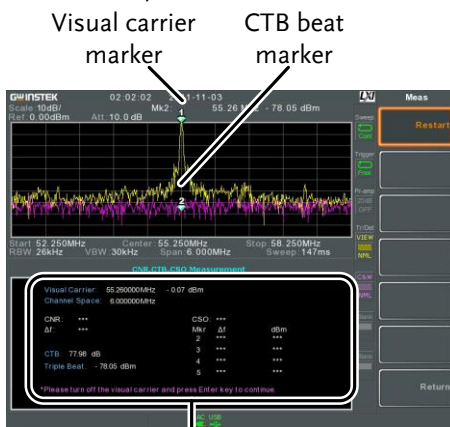
| | |
|-------------------|--|
| Description | Composite triple beat measurement calculates the difference in amplitude between the visual carrier and the composite triple beat amplitude. |
| Measurement items | Visual Carrier: frequency, amplitude CTB: amplitude difference from the visual carrier and the triple beat Triple Beat: amplitude |

Example




Operation:

1. Press **Meas** > **CNR/CSO/CTB[F7]>Setup[F1]>CTB[F2]>Return[F7]** to choose CTB measurement and return to the previous menu.
2. Press **CTB[F2]** and turn CTB on.
 - Any other measurement mode will automatically be disabled.
3. The display splits into two screens. The top shows the trace with the visual carrier marker. The bottom screen shows the CTB measurements.
 - This will place a marker (1) on the visual carrier and record the amplitude.



CTB measurements

4. Turn off the visual carrier signal from the input and press the  key on the front panel.
5. A second trace will appear to mark the CTB amplitude.
 - *This will place a marker ($\frac{2}{\diamond}$) on the second trace and calculate the difference ($\frac{1}{\diamond}-\frac{2}{\diamond}$).*
6. Press CTB CH SP[F2] to set the channel space.

Range: 0~3GHz

7. Press *Channel Move Down*[F4] or *Channel Move Up* [F5] to move to next or previous channel.



Note

To perform the CTB measurement again, press *Setup*[F1]>*CTB*[F3]>*Restart*[F1].


Limit Line Testing

The limit line is used to set the upper or lower amplitude limits over the entire frequency range. The limit lines can be used to detect whether the input signal is above, below or within the limit lines.

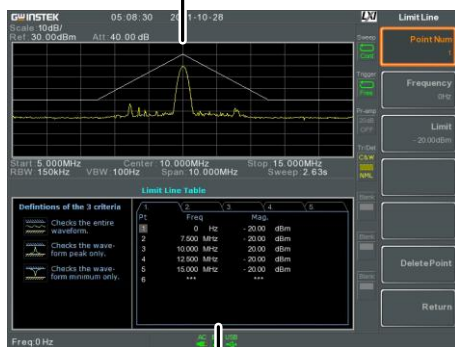
The limit lines can be manually or automatically created. The limit lines can be manually edited by frequency or from the trace data or marker points.

- Creating a Limit (Point by Point) → from page 159.
- Creating a Limit (from Trace Data) → from page 161.
- Creating a Limit (from marker data) → from page 162.
- Creating a Limit (from marker data) → from page 162
- Delete Limit Line → from page 163
- Pass Fail Testing → from page 163

Creating a Limit (Point by Point)

| | |
|-------------|---|
| Description | Create a limit manually, point by point. A maximum of ten points can be used. |
| Operation | <ol style="list-style-type: none"> Press  > <i>Edit Limit Lines</i>[F1]><i>Limit Line</i> [F1] and choose a limit line. Limit line: 1~5 Press <i>Point by Point</i>[F2]. <p>The GSP-930 is split into two screens. The top screen shows the trace and limit lines and the bottom screen shows the limit line table.</p> |

Spectrum display



Limit Line Table

3. Press *Point Num*[F1] and choose a point number to edit (must start at #1).
4. Press *Frequency*[F2] and set the frequency of the first point.
5. Press *Limit*[F3] and set the amplitude level of the point.

All the points will be displayed in a limit line table at the bottom of the display.

6. Repeat steps 3-5 for the remaining points (max 10).
7. To delete the selected point, press *Delete Point*[F6].
8. Press *Return*[F7]>*Save Save Limit Line*[F5] to save the currently selected limit line.



Note

Note that the limit lines are automatically sorted by frequency (low → high).

Creating a Limit (from Trace Data)

Description Trace data can be used to create limit lines. A 10 point limit line is created from the trace data at each grid division as well as the start and stop frequencies.

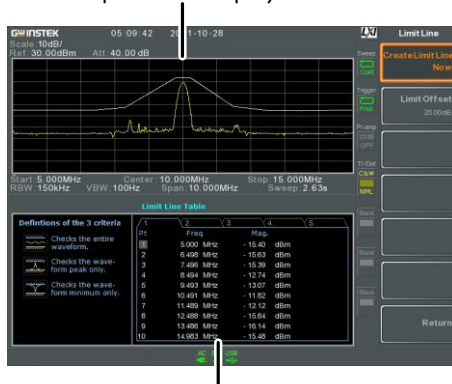
Operation 1. Press **Limit Line** > *Edit Limit Lines*[F1]>*Limit Line* [F1] and choose a limit line. (limit line 1~5).

Limit line: 1~5

2. Press *Trace Data to Limit Line*[F3].

The GSP-930 is split into two screens. The top screen shows the trace and limit lines and the bottom screen shows the limit line table.

Spectrum display



Limit Line Table

3. Press *Limit Offset*[F2] and set an offset level.

4. Press *Create Limit Line Now*[F1].

- A limit line will automatically be created based on the trace and offset level.

- A limit line can be created any number of times.
5. Press *Return*[F7]>*Save Save Limit Line*[F5] to save the currently selected limit line.

Creating a Limit (from marker data)

Description Marker data can be used to create limit lines. Please see the marker chapter on page 83 for details on markers. A maximum of 10 points can be created.

- Operation**
1. Press **Limit Line** > *Edit Limit Lines*[F1]>*Limit Line* [F1] and choose a limit line.

Limit line: 1~5

2. Press *Mkr Data to Limit Line*[F4].

The GSP-930 is split into two screens. The top screen shows the trace and limit lines and the bottom screen shows the limit line table.

Spectrum display



Limit Line Table

3. Press *Point Num*[F1] and choose a point number

to edit (must start at #1).


4. Press *Limit Offset*[F3] and set offset level for the point.
5. Press *Mkr Data to Point*[F2]. This adds the currently active marker's position to the selected point.
6. The marker position can be moved at this point using the scroll wheel. Press the Enter key to set the position.
7. Repeat steps 3-5 for any other points (max 10).
8. Press *Return*[F7]>*Save Limit Line*[F5] to save the currently selected limit line.



Note

Using this function will also change the position of marker 1 outside of the limit function.


Delete Limit Line

| | |
|---------------------|--|
| Description | Any one of the 5 limit lines can be deleted. |
| Activate Correction | <ol style="list-style-type: none"> 1. Press  > <i>Edit Limit Lines</i>[F1]><i>Limit Line</i>[F1] and choose a limit line (limit line 1~5) to delete. 2. Press <i>Delete Limit Line</i>[F6]. The data from the chosen limit line will be deleted. |

Pass Fail Testing

| | |
|-------------|---|
| Description | Before pass/fail testing can begin, limit lines for the upper and lower limits must first be saved. See the page 116. |
|-------------|---|

Operation

1. Press  > *Pass/Fail Test*.
2. To set a high limit, press *High Limit*[F1] and choose one of the limit lines as the upper (high) limit.
3. To set the low limit, press *Low Limit*[F2] and select one of the limit lines as the lower limit.
4. Press *Pass Criterion*[F3] and select the pass criteria.

Criteria: All-In, Max-In, Min-In

5. Press *Pass/Fail Test* and turn the testing on.
6. The test result appears in the bottom of the display.

Pass: PASS

Fail: FAIL

Display Icon



The alarm icon is shown at the bottom of the display whenever testing is turned on.



Note

At least one limit line (high or low) must be turned on to enable testing.

If the high limit or low limit is turned off, the maximum or minimum* display level is set automatically as the high or low limit, respectively.

* +30dBm+Ref level offset or -120dBm+Ref level offset


Sequence

The Sequence function records and plays back user-defined macros, up to 5 sequences are available in repeat or single running mode, each with up to 20 steps. Delays and pauses can also be introduced into a sequence to view measurement results during a sequence. Sequences can also call other sequences to create longer sequences.


The sections below can be used to skip to the relevant section:

- Edit Sequence → from page 165
- Run Sequence → from page 169

Editing a Sequence

Edit a Sequence 7. Press  > *Sequence*[F1] and choose a sequence to edit/create.

Sequence: 1~5

8. Press *Edit*[F2]>*Start Edit*[F1] to start editing the selected sequence.
9. The display splits into two screens. The top screen shows the main screen. The bottom screen shows the Sequence Editor with the sequence steps.
 - The  **Start Edit** icon appears in the sequence editor window.

Main display



Start
Edit/Stop
Edit icon

Sequence Editor window

Add a Step

Up to 20 steps can be added to each sequence. Each panel operation is recorded as a step. After each panel operation is performed, press the **Enter** key to record the step (in some cases this is not necessary – check if the operation appears in the sequence editor window).

In the following example the center frequency and span are added as steps to a sequence:

1. Press **Frequency** > *Center Freq[F1]* > 20MHz > **Enter** .
2. Press **Span** > *Zero Span[F3]* > **Enter** .
3. The two operations are added to the Sequence Editor.

CenterFreq: 20.000MHz
ZeroSpan



Note


The arrow keys can be used to move the cursor to the desired step.

Add Delay to Sequence

The delay function adds a delay between steps.

1. Press *Delay Time*[F2]> and enter the delay time.

Range: 100ms ~ 10s

2. Press  to add the delay time to the sequence editor.
- *The delay time will be inserted as a step.*




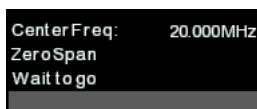

Note

The arrow keys can be used to move the cursor to the desired step.

Pause Sequence

The Wait to Go function is used to pause a sequence until *Continue*[F1] is pressed. This is useful for observing measurements before moving onto the next step.

1. Press *Wait to Go*[F3]> .
- *Wait to Go will be inserted as a step.*



2. When a sequence is running, Press *Continue*[F1] to resume running the sequence.

Insert Sequence

Inserts another sequence into the current sequence.

1. Press *Do Sequence*[F4]> and select a sequence to insert into the current sequence.
 - *The selected sequence will be inserted as a step.*

| | |
|-------------|-----------|
| CenterFreq: | 20.000MHz |
| Sequence: | 2 |
| ZeroSpan | |



Note

The current sequence cannot be inserted into itself.

Delete Step

Any step in the Sequence Editor can be deleted.

1. Use the arrow keys on the front panel to highlight the step you wish to delete.




| | |
|-------------|-----------|
| CenterFreq: | 20.000MHz |
| Span: | 10.000MHz |
| RefLevel: | 0.00dBm |


2. Press *Delete Step*[F5] > to delete the step.
 - *The selected step will be removed from the Sequence editor.*


| | |
|-------------|-----------|
| CenterFreq: | 20.000MHz |
| RefLevel: | 0.00dBm |

Stop Editing

1. Press *Stop Edit*[F6].
2. The  **Start Edit** icon turns off.


Save Current Sequence After a sequence has been edited (and stopped) it can be saved.

1. Press  > Save Sequence[F4] > to save the sequence.
 2. The selected sequence will be saved.
-

Delete Current Sequence 1. Press  > Delete Sequence [F5] > to delete the current sequence.

Running a Sequence

Run Mode

1. Press  > *Sequence*[F1] and choose a sequence.
2. Press *Run Mode*[F6] and toggle the run mode:

| | |
|--------|---|
| Single | Runs the sequence once only. |
| Cont. | Runs the sequence continually until Stop Running Sequence[F7] is pressed (Note: the Stop Running Sequence[F7] option only appears when the sequence is running) |

Run Sequence

3. Press *Run Now*[F7] to start running the selected sequence.
4. Press *Stop Running Sequence*[F7] to stop the sequence.
 - *In single mode the sequence will stop running when all steps have finished.*


Tracking Generator

The tracking generator is a factory installed option that generates a sweep signal with its sweep time and frequency range matching the GSP-930. The amplitude is maintained at a constant value over the entire frequency range. This is useful for testing the frequency response of the DUT.

- Activate the Tracking Generator → from page 170
- Normalize the Tracking Generator → from page 171

Activate Tracking Generator

Operation

1. Press  > More 1/2[F7] > Option[F1] > Tracking Generator[F1] > TG[F1] and toggle the tracking generator on.
 - *The TG OUTPUT will be activated.*

2. Press *TG Level*[F2] to set the output level of the tracking generator.

Range: -50 to 0dBm

3. Press *TG Lvl Offset*[F3] to set the offset level of the tracking generator to compensate for system gain/loss.

Range: -10dB to 10dB

4. Press *TG Lvl Step*[F4] to set the step resolution of the TG level.

Range: 0.5 to 50dB, 0.5dB step


5. Press *Power Sweep*[F5] to vary the output power of the TG to the rate of the sweep. At the beginning of the sweep, the output power is at

the set TG Level and increases/decreases linearly to the set Power Sweep level at the end of the sweep.

Range: -5dB to +5dB

Normalize the Tracking Generator

| | |
|------------|---|
| Background | The normalize function subtracts the trace after each sweep with a reference trace. The resultant trace is added to a normalized reference level. |
|------------|---|

- | | |
|-----------|---|
| Operation | <ol style="list-style-type: none"> 1. Press  > More 1/2[F7] > Option[F1] > Tracking Generator[F1] > TG[F1] and toggle the tracking generator on. 2. Press <i>Normalize</i>[F6] to enter the Normalization menu. 3. Press <i>Norm. Ref. Level</i>[F2] to set the vertical level of the normalized reference. |
|-----------|---|

Range: 0dB~100dB

4. Press *Norm. Ref. Position*[F3] offsets the normalized trace on the screen.

Range: 10~0 grid divisions.
(top to bottom)

5. Press *Norm.*[F5] to toggle the normalized data on/off.

Alternatively, press *Exe. Norm.*[F1] to perform the normalization again.



Note

The normalized data will be turned off automatically if any X-axis related parameters are changed or if the TG output level is changed.

The warning message, “Execute Normalization again!” will appear under these circumstances.

Power Meter

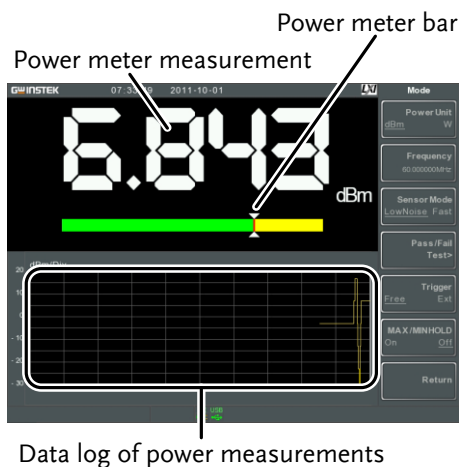
When using the optional power meter, the GSP can measure and log the average signal power level of a DUT from -32dBm ~ +20dBm over an operating frequency range of 1Mhz to 6.2GHz.

- Activating Power Meter Mode → from page 173
- Data Logging Power Meter Measurements → from page 175

Activating Power Meter Mode

Operation

1. Press **Mode** > *Power Meter*[F2] to enter the power meter mode.
2. The display splits into two screens. The top screen shows the power measurement in dBm or W. The bottom screen shows a graph of the measurements.



3. Press *Power Unit*[F1] and choose the unit:

Unit dBm, W

4. Press *Frequency*[F2] choose measurement frequency:

Frequency 1MHz~6200MHz

Resolution: 1MHz

5. Press *Sensor Mode*[F3] to choose measurement speed (and thus accuracy) of the power meter:

Low Noise: 100ms/sample, typical

Fast: 30ms/sample, typical

- To create pass fail tests, press *Pass/Fail Test*[F4] and set the following parameters:

High Limit[F1]: -100dBm~20dBm

Low Limit[F2]: -100dBm~20dBm

Pass/Fail Test[F3]: On, Off

Pass Icon:

PASS

Fail Icon:

FAIL

7. Press *Trigger[F5]* to toggle between a free run (internal) trigger and an external trigger.

Trigger: Free, Ext


Ext trigger input: 3.3V CMOS



8. Press *MAX/MIN HOLD[F6]* to toggle the MAX/MIN hold measurements on/off in the power meter bar.
 - *The MIN/MAX measurements will be displayed in the power bar meter in the center of the screen.*




Note

The return to the Spectrum Mode, press  > *Spectrum[F1]*.

Data Logging Power Meter Measurements

Description When in Power Meter mode, the spectrum analyzer is able to log the power meter measurements over a user-defined time period at user-defined intervals.

- Operation**
1. Press  to enter the save menu.
 2. Press *Type[F2]* and select *Power Meter[F7]*.
 3. Press *Data Source[F3]* and select *Power State[F1]*.
 4. Press *PMET Record Option[F4]* and set the recording options:

Record Stop[F1]: Sets the recording time for automatic data logging:
 00 :00 :00 (continuous) or
 00 :00 :01 ~ 23 :59 :59

Record Step[F2]: 1sec ~ 999sec
 5. Press *Save To[F1]* and select a destination source:

Register 1~6: Internal memory registers, these internal registers are not part of local memory

Local: Internal memory

SD Card:

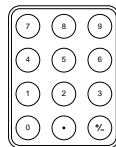
External micro SD card



Note

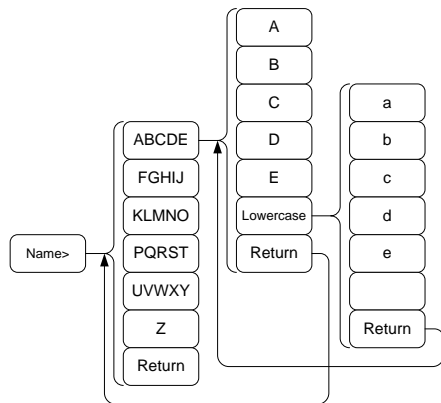
The micro SD card option will only be available when a micro SD card is inserted into the front panel port.

6. After a destination has been selected, recording options appear.
7. To name the log file, press *Name[F1]*. Name the selected file using the F1~F7 keys, as shown below or use the numeric keypad to enter numbers.



Limitations:


- *No spaces*
- *Only 1~9, A~Z, a~z characters allowed*



8. The filename appears on the bottom of the screen as it is created.



Filename

Press  to confirm setting the filename.



Note

If the file name is not user-defined, a file name will be automatically created in the following format:

File name: type_data source_file number.file extension

The file number parameter is incremented each time the same file type is created.

9. To start recording power meter measurements, press *Record Now*[F3].

A message "SaveFinish!!" will be displayed at the bottom of the screen when the recording has finished.

Stop Recording

To manually stop the recording, press *Record Stop*[F2].

FILE

File Overview

The File function is used for basic file related operations including navigation, sorting coping and deleting. The GSP-930 has a number of different file formats for trace data, limit lines, amplitude correction, sequences and other panel operations. File source and destination locations (local, USB or micro SD) can also be chose with the file function.

- File Type Overview → from page 179
- File Types → from page 180
- Using the File Explorer → from page 181
- Copy Files → from page 183
- Move Files → from page 183
- Delete Files → from page 184
- Rename Files→ from page 185
- Save Files → from page 187
- Recall Files → from page 190
- Quick Save → from page 192

File Type Overview

| | | | |
|----------|---|------------|--|
| Local | The GSP-930 has 16MB of local memory to save data to. | | |
| USB | The GSP-930 can save to an external USB flash memory drive. | | |
| | USB Type: | 1.1/2.0 | |
| Micro SD | The GSP-930 can save to a micro SD card. | | |
| | Format: | SDSC, SDHC | |


File Types

| | |
|------------|---|
| Overview | The file types are listed in order as shown in the file |
| State | <p>State data contains the state of the each of the panel operations:</p> <hr/> <ul style="list-style-type: none"> • <i>Frequency</i> • <i>Span</i> • <i>Amplitude</i> • <i>BW/Avg</i> • <i>Sweep</i> • <i>Trace</i> • <i>Display</i> • <i>Meas</i> • <i>Limit Line</i> • <i>Sequence</i> • <i>Trigger</i> • <i>Marker</i> • <i>Marker-></i> • <i>Peak Search</i> • <i>Preset</i> • <i>Mode</i> • <i>System</i> <hr/> |
| Trace | <p>Trace data contains the trace data in comma separated values.</p> <ul style="list-style-type: none"> • <i>Center frequency</i> • <i>Span</i> • <i>Resolution Bandwidth</i> • <i>Video Bandwidth</i> • <i>Reference Level</i> • <i>Sweep Time</i> • <i>Point number (trace data points)</i> <hr/> |
| Screen | Contains the JPEG file of the display (800X600) |
| Limit Line | <p>The limit line data contains the following in comma separated values:</p> <ul style="list-style-type: none"> • <i>Point number</i> • <i>Frequency value of point</i> • <i>Magnitude of point</i> • <i>Magnitude unit</i> <hr/> |

| | |
|-------------|--|
| Correction | Correction data contains the following correction (line) data: <ul style="list-style-type: none">• <i>Point number</i>• <i>Frequency value of point</i>• <i>Gain offset of point</i>• <i>Unit</i> |
| Sequence | The sequence files contain the sequence number and step operations for that sequence. This data is not designed to be user editable. |
| Power Meter | The power meter data contains: <ul style="list-style-type: none">• <i>Date</i>• <i>Time</i>• <i>Power in dBm</i> |

Using the File Explorer

| | |
|-------------------------|---|
| Connect External Memory | To view files on a USB flash drive or micro SD card, insert the appropriate device into the front panel port. |
|-------------------------|---|

- Selecting files
1. Press  >File Explorer.
 2. Select memory location:

| | |
|---------------------|-------------------------|
| <i>Local[F1]:</i> | Internal memory |
| <i>USB[F2]:</i> | Front panel USB memory. |
| <i>SD Card[F3]:</i> | Micro SD card. |
 3. The up/down arrow keys or the scroll wheel can be used to move up/down the file list.



4. The left/right arrow keys can be used to move to the next/previous page of files in the file list.



View Files by Type The file explorer can be configured to only view files of a certain type. For details on file types, please see page 179.

1. Press *Type*[F2] and select a file type to view:

| | |
|-------------|------------------------------|
| All | All file types can be viewed |
| State | View state files only |
| Trace | View trace files only |
| Screen | View screen shots only |
| Limit Line | View limit lines only |
| Correction | View correction data only |
| Sequence | View sequence files only |
| Power Meter | View power meter files only |

After selecting a file type, only those types of files will be listed by the file explorer.

Sort Files Files can be sorted in ascending order by either name or by date. By default, files are sorted by name.

1. Press *Sort By*[F3] and choose the sorting type:

| | |
|-------|----------------------------|
| Name: | Sort by alphabetical order |
| Date | Sort by file creation date |




Note

The USB and micro SD card options will only be available when a flash drive/SD card is inserted into the front panel ports.

Copy Files

| | |
|-------------|---|
| Description | Files from local memory can be copied to external memory such as USB or micro SD card and vice versa. |
|-------------|---|

| | |
|-------------------------|---|
| Connect External Memory | Insert either a USB flash drive or micro SD card into the front panel connectors. |
|-------------------------|---|

- | | |
|-----------------|--|
| Selecting files | <ol style="list-style-type: none">1. Press  >File Explorer.2. Select a file from local or external memory.3. Press <i>Copy to</i> [F4].4. Press <i>Media</i> [F1] and select the destination to copy to (local, USB, SD card).5. Press <i>Copy Now</i> [F2].6. The file is copied to the destination directory. |
|-----------------|--|
-




Note

The USB and micro SD card options will only be available when a flash drive/SD card is inserted into the front panel ports.

Move Files

| | |
|-------------|--|
| Description | Files from local memory can be moved to external memory such as USB or micro SD card and vice versa. |
|-------------|--|


| | |
|-------------------------|---|
| Connect External Memory | Insert either a USB flash drive or micro SD card into the front panel connectors. |
|-------------------------|---|

- Selecting files
1. Press  >File Explorer.
 2. Select a file from local or external memory.
 3. Press *Move to*[F4].
 4. Press *Media* [F1] and select the destination to move to (local, USB, SD card).
 5. Press *Move Now* [F2].
 6. The file is moved to the destination.

**Note**

The USB and micro SD card options will only be available when a flash drive/SD card is inserted into the front panel ports.

Delete Files

| | |
|-------------------------|---|
| Description | Any files in local memory or external memory such as USB or micro SD card can be deleted. |
| Connect External Memory | To delete files on a USB flash drive or micro SD card, insert the appropriate device into the front panel port. |
| Delete File | <ol style="list-style-type: none">1. Press  >File Explorer.2. Select a file from local or external memory.3. Press <i>Delete</i>[F5].4. Press <i>Delete Now</i>[F1].5. The file will be deleted after <i>Delete Now</i> is pressed. |

| | | | | | |
|----------------|---|-----------|--|-----|--|
| Delete Warning | 1. To enable a prompt to confirm the deletion of a file, press <i>Delete Warning</i> [F2] and select an option: | | | | |
| | <table><tr><td>Don't Ask</td><td>No confirmation dialog box will appear when a file is deleted.</td></tr><tr><td>Ask</td><td>Will prompt for the user to confirm whether to delete the file or not.</td></tr></table> | Don't Ask | No confirmation dialog box will appear when a file is deleted. | Ask | Will prompt for the user to confirm whether to delete the file or not. |
| Don't Ask | No confirmation dialog box will appear when a file is deleted. | | | | |
| Ask | Will prompt for the user to confirm whether to delete the file or not. | | | | |




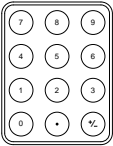
Note

The USB and micro SD card options will only be available when a flash drive/SD card is inserted into the front panel ports.

Rename Files

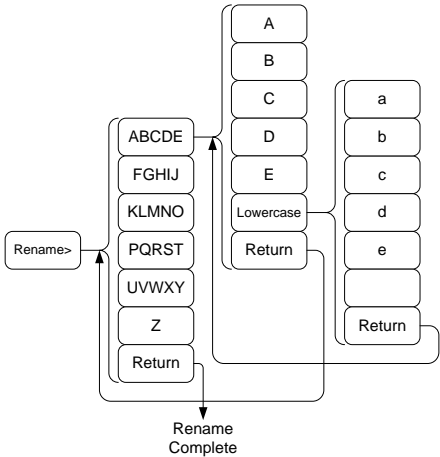
| | |
|-------------------------|--|
| Description | Any files in local memory or external memory such as USB or micro SD card can be renamed. |
| Connect External Memory | To rename files on a USB flash drive or micro SD card, insert the appropriate device into the front panel ports. |

- Rename File
1. Press  >File Explorer.
 2. Select a file from local or external memory.
 3. Press *Rename*[F6].
 4. Rename the selected file using the F1~F7 keys, as shown below or use the numeric keypad to enter numbers:

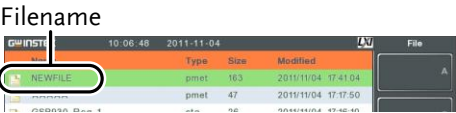



Limitations:

- *No spaces*
- *Only 1~9, A~Z, a~z characters allowed*



5. The filename appears in the list as it is renamed.




6. Press  to confirm the renaming of the file.




Note

The USB and micro SD card options will only be available when a flash drive/SD card is inserted into the front panel ports.

Save Files

| | |
|-------------|---|
| Description | Any function settings or configurations that have been applied to the spectrum analyzer can be saved using the  key. |
|-------------|---|

| | |
|-------------------------|--|
| Connect External Memory | To save files on a USB flash drive or micro SD card, insert the appropriate device into the front panel ports. |
|-------------------------|--|

- Save File
1. Press  to enter the Save menu.
 2. Press *Type[F2]* and select a file type to save. See page 179 for details on file types:

| | |
|-------------|------------------|
| State: | State data |
| Trace: | Trace data |
| Screen: | Screen shots |
| Limit Line: | Limit line data |
| Correction: | Correction data |
| Sequence: | Sequence files |
| Power meter | Power meter data |

3. Press *Data Source[F3]* to select a data source for the file type if needed:

| | |
|-------------------|---|
| For state data: | Local state data |
| For trace data: | Trace1~4 |
| For screen shots: | Normal: Screen shot is saved as is Save Toner: inverts the image file color to reduce ink when printing. |
| For limit line: | Limit line 1~5 |
| For correction: | Correction data 1~5 |
| For sequence: | Sequence 1~5 |

For power meter: Power meter 1 ~5

4. For trace data, press Format[F4] to select the format type to save:

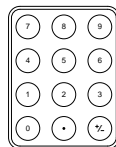
| | |
|--------------|---------------------------|
| Trace: | Save trace data only |
| Trace+State: | Save trace and state data |

5. Press *Save To*[F1] and select a destination source:

| | |
|---------------|--|
| Register 1~6: | Internal memory registers, these internal registers are not part of local memory |
| Local: | Internal memory |
| USB: | External memory |
| SD Card: | External micro SD card |

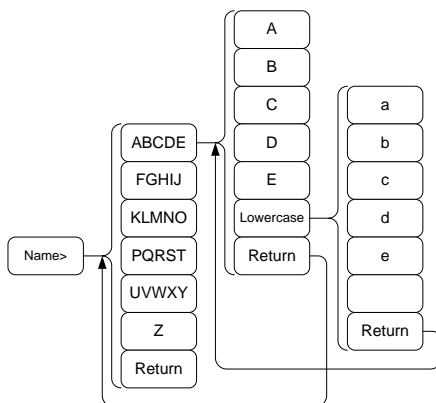
6. After a destination has been selected, the file can be named or saved immediately.

7. To name the selected file, press *Name*[F5]. Name the selected file using the F1~F7 keys, as shown below or use the numeric keypad to enter numbers.:

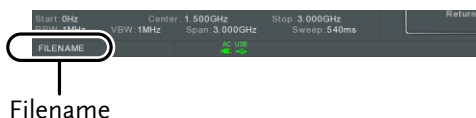



Limitations:

- *No spaces*
- *Only 1~9, A~Z, a~z characters allowed*



8. The filename appears on the bottom of the screen as it is created.



9. Press  to confirm the naming of the file.



Note

If the file name is not user-defined, a default naming scheme will be used. See the note below for details.

10. To save the selected file type, press *Save Now*[F3].

A message “SaveFinish!!” will be displayed at the bottom of the screen when the save is successful.



Note

If the file name is not user-defined, a file name will be automatically created in the following format for data files:

File name: Type_data source_XX.file extension

The image file names will be automatically created in the following format:

File name: NowPicture_XX.jpg


The XX parameter is incremented each time the same file type is created.




Note

The USB and micro SD card options will only be available when a flash drive/SD card is inserted into the front panel ports.

Recall Files

| | |
|-------------|--|
| Description | Any file that has previously been saved can be recalled using the  key. |
|-------------|--|

| | |
|-------------------------|--|
| Connect External Memory | To recall files from a USB flash drive or micro SD card, insert the appropriate device into the front panel ports. |
|-------------------------|--|

1. Press  to enter the Recall menu.
2. Press *Type[F2]* and select a file type to save. See page 179 for details on file types:

| | |
|-------------|-----------------|
| State: | State data |
| Trace: | Trace data |
| Limit Line: | Limit line data |
| Correction: | Correction data |
| Sequence: | Sequence files |

Power meter Power meter data

3. Press *Destination*[F3] to select the destination for the file type:

For State data: Local state data
 For Trace data: Trace1~4
 For Limit Lines: Limit line 1~5
 For Correction: Correction data 1~5
 For Sequence: Sequence 1~5
 For Power Meter: Power meter 1 ~5

Recall File

1. Press *Recall From*[F1] and select a source location:

Register 1~6: Internal memory registers,
 these internal registers are not
 part of local memory
 Local: Internal memory
 USB External USB memory
 SD Card: External micro SD card

2. To Recall the selected file type, press *Recall Now*[F1].
3. A message "Finish!!" will be displayed at the bottom of the screen when the recall is successful.





Note


The USB and micro SD card options will only be available when a flash drive/SD card is inserted into the front panel ports.

Quick Save

Description

The  key is a hot key to save files with a single press.

The type of file that is saved is pre-configured with the  key.

By default, the  the key will save screen shots to the local memory or to an external flash drive (if inserted).


Supported File Types

Screen, trace, state, limit line, correction, sequence.


Connect External Memory

To save files a USB flash drive or micro SD card, insert the appropriate device into the front panel ports.

Quick Save Setup

1. Press the  key and configure the file Type, Data Source and Format. See page 187 for details.
-

Using the Quick Save key

1. Press  at any time to save the selected file type using the settings above.
2. A “Save Finish!!” message will shown at the bottom of the screen when the save has been completed.



Note

The file name will be automatically created in the following format for data files:

File name: Type_data source_XX.file extension

The image file names will be automatically created in the following format:

File name: QuickJpg_XX.jpg

The XX parameter is incremented each time the same file type is created.



Note

The USB and micro SD card options will only be available when a flash drive/SD card is inserted into the front panel ports.

REMOTE CONTROL

This chapter describes basic configuration of IEEE488.2 based remote control. For a command list, refer to the programming manual, downloadable from GW Instek website, www.gwinstek.com

Interface Configuration 195

Configure to USB Remote Interface 195

Configure GPIB Interface 195

Configure the LAN and LXI Interface 196


Configure RS232C 199

RS232C Remote Control Function Check 199

LXI Browser Interface and Function Check..... 201

Interface Configuration

Configure to USB Remote Interface

| | | |
|-------------------|--|---------------------------------|
| USB configuration | PC side connector | Type A, host |
| | GSP side connector | Rear panel Type B, slave |
| | Speed | 1.1/2.0 (full speed/high speed) |
| | USB Class | USB TMC (USB T&M class) |
| Panel operation | 1. Connect the USB cable to the rear panel USB B port. | |
| | 2. Press  >More 1/2[F7]>RmtInterface Config[F2]>USB Mode and toggle the USB mode to Device. | |



Note

It may take a few moments to switch USB modes.

Configure GPIB Interface

To use GPIB, the optional GPIB port must be installed.

- Configure GPIB
1. Ensure the spectrum analyzer is off before proceeding.
 2. Connect a GPIB cable from a GPIB controller to the GPIB port on the spectrum analyzer.
 3. Turn the spectrum analyzer on.



4. Press System >More 1/2[F7]>RmtInterface
Config[F2]>GPIB Addr and set the GPIB
address.

GPIB address 0~30

- GPIB constraints
- Maximum 15 devices altogether, 20m cable length, 2m between each device
 - Unique address assigned to each device
 - At least 2/3 of the devices turned On
 - No loop or parallel connection

Configure the LAN and LXI Interface

The GSP-930 is a class C LXI compliant instrument. The LXI specification allows instrumentation to be configured for basic remote control or monitoring over a LAN.

For details on the LXI specification and compliance classes, please see the LXI website @ <http://www.lxistandard.org>.


Background The LAN interface is used for remote control over a network. The spectrum analyzer supports DHCP connections so the instrument can be automatically connected to an existing network. Alternatively, network settings can also be manually configured.

| | | |
|----------------------------|-------------|-----------------|
| LAN configuration Settings | IP Address | Default Gateway |
| | Subnet Mask | DNS Server |
| | DHCP on/off | |

Connection Connect an Ethernet cable from the network to the rear panel LAN port.



Settings

- Press  > More 1/2[F7] > RmtInterface > LAN[F2] > LAN Config[F1] to set the LAN settings:

IP Address[F1] Sets the IP address.
Subnet Mask[F2] Sets the subnet mask.
Default Gateway[F3] Sets the default gateway.
DNS Server[F4] Sets the DNS server address
LAN Config[F5] Toggles the LAN configuration between DHCP and manual settings.
- Press *Apply[F6]* to confirm the LAN configuration settings.

Display Icon




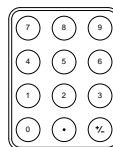
The LXI icon turns green when connected to a LAN and will flash if the “Identification” setting is on, see page 201.

Set Password

The password on the LXI webpage can be set from the spectrum analyzer. The password is shown in the system information.

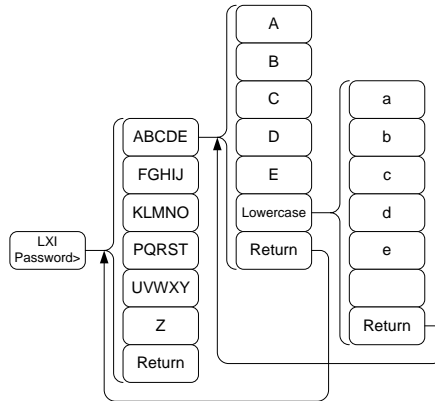
By default the password is set to: lxiWNpwd

- Press  > More 1/2[F7] > RmtInterface Config[F2] > LAN[F2] > LXIPassword[F2] to set the password.
- Enter the password using the F1~F7 keys, as shown below, or use the numeric keypad to enter numbers:



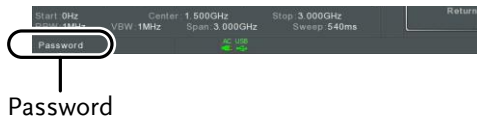
Limitations:

- No spaces
- Only 1~9, A~Z, a~z characters allowed



Menu tree to enter the password

3. The password appears on the bottom of the screen as it is created.



4. Press **Enter** to confirm setting the password.

Reset LAN

It may be necessary to reset the LAN configuration settings before the LAN can be used.

1. Press **System** > More 1/2[F7]>RmtInterface Config[F2]>LAN Reset[F3] to reset the LAN.
2. The GSP-930 will now automatically reboot.

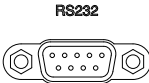



Note

Each time the LAN is reset, the default password is restored.

Default password: lxiWNpwd

Configure RS232C

| | | |
|-------------------------------|---|---|
| Background | The RS232C interface is used for remote control with a PC. | |
| RS232C Configuration settings | Baud Rate | Stop bit: 1 (fixed) |
| | Parity: none (fixed) | Data bit: 8 (fixed) |
| Connection | Connect an RS232C cable from the PC to the rear panel RS232 port. |  |

1. Press  > More 1/2[F7]> RmtInterface Config> RS232 BaudRate[F4] to set the baud rate.
- | | | |
|--------|-------|-------|
| 300 | 600 | 1200 |
| 2400 | 4800 | 9600 |
| 19200 | 38400 | 57600 |
| 115200 | | |

RS232C Remote Control Function Check

| | |
|---------------------|---|
| Functionality check | Invoke a terminal application such as MTTTY (Multi-Threaded TTY). |
| | To check the COM port No, see the Device Manager in the PC. For WinXP; Control panel → System → Hardware tab. |
| | Run this query command via the terminal after the instrument has been configured for RS232 remote control (page 197). |
| | *idn? |
| | This should return the Manufacturer, Model |

number, Serial number, and Firmware version in the following format.

- *GW-INSTEK,GSP-930,XXXXXXXXXXXXX,
V.X.X.X.X*

Manufacturer: GW-INSTEK

Model number : GSP-930

Serial number : XXXXXXXXXXXXX

Firmware version : V.X.X.X



Note

For further details, please see the programming manual, available on the GW Instek web site @ www.gwinstek.com.

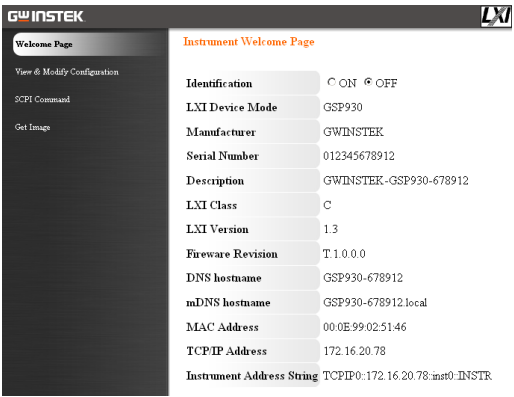
LXI Browser Interface and Function Check

Functionality check Enter the IP address of the spectrum analyzer in a web browser after the instrument has been configured and connected to the LAN (page 196).

http:// XXX.XXX.XXX.XXX

The web browser interface appears:

Welcome Page The Welcome Page lists all the LXI and LAN configuration settings as well as the instrument identification. The instrument identification can be disabled from this page.



 Note



The LXI icon in the GSP-930 display will flash when the Identification setting is turned on.

View & Modify Configuration

The View & Modify Configuration allows you to modify the LAN settings from the browser. A password must be entered to alter the settings.

Password: lxiWNpwd

[Note: password is case sensitive.]

GW INSTEK

Welcome Page

View & Modify Configuration

Configuration of your spectrum analyzer

Apply | Undo Change | Factory Defaults

TCP/IP Configuration Mode: ☒ Automatic (DHCP) ☐ Manual

IP Address: 172.16.20.78

Subnet Mask: 255.255.255.0

Gateway: 172.16.0.254

DNS Server: 172.16.1.252, 172.16.1.248

DNS hostname: GSP930-678912

Description: GW INSTEK-GSP930-678912

Password: ☐ Change Password

(Enter Old Password):

(Enter New Password):

(Confirm New Password):



Note

If the “Factory Defaults” option is chosen, the password will be reset back to the default password

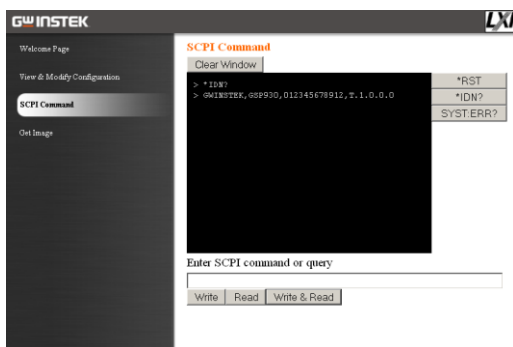
It will also be necessary to manually reset the spectrum analyzer when a message prompts you to do so on the web browser.

SCPI Command

The SCPI Command page allows you to enter SCPI commands directly from the browser for full remote control. Please see the programming manual for details. A password must be entered before remote commands can be used.

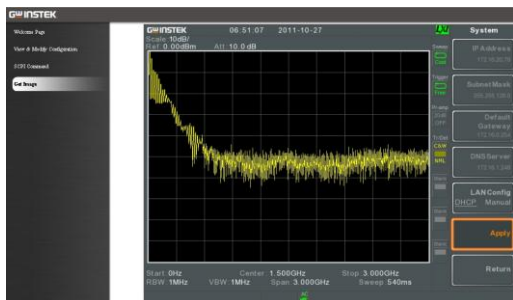
Password: lxiWNpwd

[Note: password is case sensitive.]



Get Image

The Get Image page allows the browser to remotely capture a screenshot of the GSP-930 display.



Note

For further details, please see the programming manual, available on the GW Instek web site @ www.gwinstek.com.

GPIO/LAN Control Function Check

Functionality
check

Please use the National Instruments
Measurement & Automation Controller
software to confirm GPIO/LAN functionality.

See the National Instrument website,
<http://www.ni.com> for details.



Note

For further details, please see the programming
manual, available on the GW Instek web site @
www.gwinstek.com.

F

FAQ

-
- I connected the signal but it does not appear on screen.
 - I want to see which optional items are installed.
 - The performance does not match the specification

I connected the signal but it does not appear on screen.

Run Autoset and let the GSP-930 find the best display scale for your target signal. Press the Autoset key, then press Autoset[F1]. For details, see page 59.

I want to see which optional items are installed.

Check the optional items in the system information window. Press the System key → System Information[F1]. For details, see page 105.

The performance does not match the specification.

Make sure the device is powered On for at least 30 minutes, within +20°C~+30°C. This is necessary to stabilize the unit to match the specification.

For more information, contact your local dealer or GWInstek at www.gwinstek.com / marketing@goodwill.com.

APPENDIX

Replace the Clock Battery

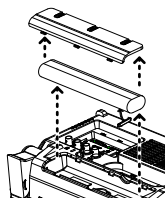
Background

The system clock and wake-up clock keep time using a button battery.

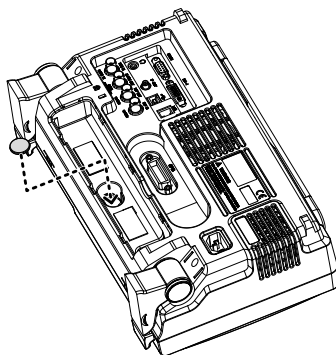
Battery type: CR2032, 3V, 210mAh

Connection

1. Turn off the GSP-930 and remove the battery cover and battery (if connected).



2. Replace the battery with the same type and specification.



Glossary of Acronyms

| Acronym | Definition |
|-----------|---|
| 3GPP | 3 rd Generation Partnership Project |
| ACPR | Adjacent Channel Power Ratio |
| BS | Base Station |
| CF | Center Frequency |
| CH BW | Channel Bandwidth |
| CH SPC | Channel Space |
| CNR | Carrier to Noise Ratio |
| CSO | Composite Second Order |
| CTB | Composite Triple Beat |
| DANL | Displayed Average Noise Level |
| Def. | Default |
| DL | Down Link |
| DSSS-OFDM | Direct Sequence Spread Spectrum- Orthogonal Frequency Division Multiplexing |
| EMI | Electromagnetic Interference |
| ERP-CCK | Extended Rate Physical layer- Complimentary Code Keying |
| ERP-DSSS | Extended Rate Physical layer- Direct Sequence Spread Spectrum |
| ERP-OFDM | Extended Rate Physical layer- Orthogonal Frequency Division Multiplexing |
| ERP-PBCC | Extended Rate Physical layer- Packet Binary Convolutional Code |
| ETSI | European Telecommunications Standards Institute |
| FDD | Frequency-Division Duplexing |
| IF | Intermediate Frequency |
| LOI | Local Oscillator |
| LPF | Low Pass Filter |
| LXI | LAN eXtensions for Instrumentation |
| OCBW | Occupied Channel Bandwidth |
| PSD | Power Spectral Density |
| RBW | Resolution Bandwidth |
| REF | Reference |
| SEM | Spectrum Emission Mask |
| SINAD | Signal to Noise and Distortion Ratio |
| TDD | Time-Division Duplexing |

| | |
|-----|-----------------------|
| TG | Tracking Generator |
| TOI | Third Order Intercept |
| UE | User Equipment |
| UP | Up Link |
| VBW | Video Bandwidth |

GSP-930 Default Settings

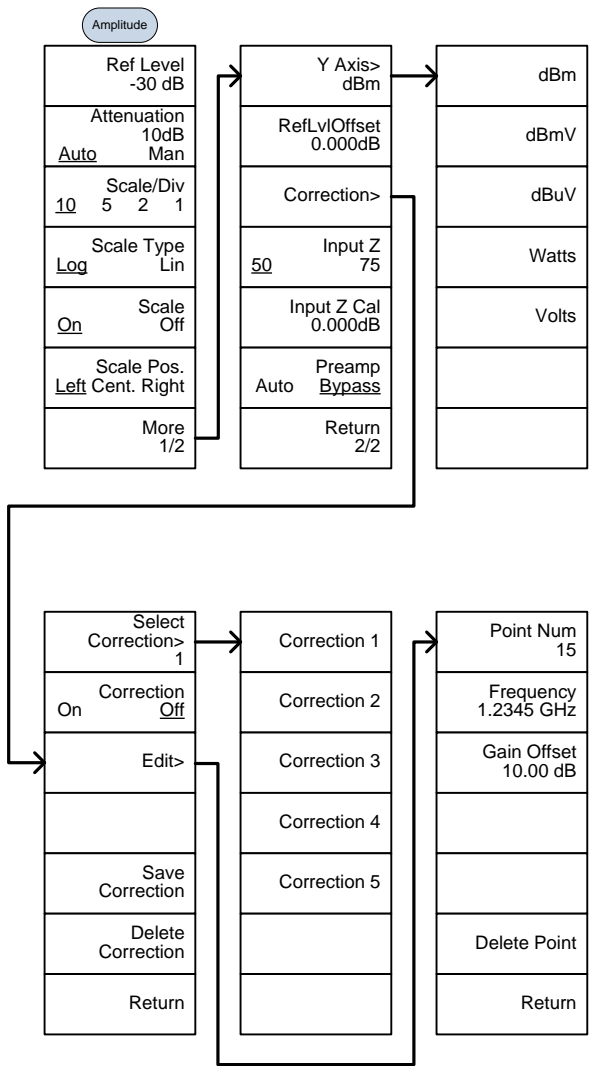
The following default settings are the factory configuration settings for the spectrum analyzer (Function settings/Test settings).

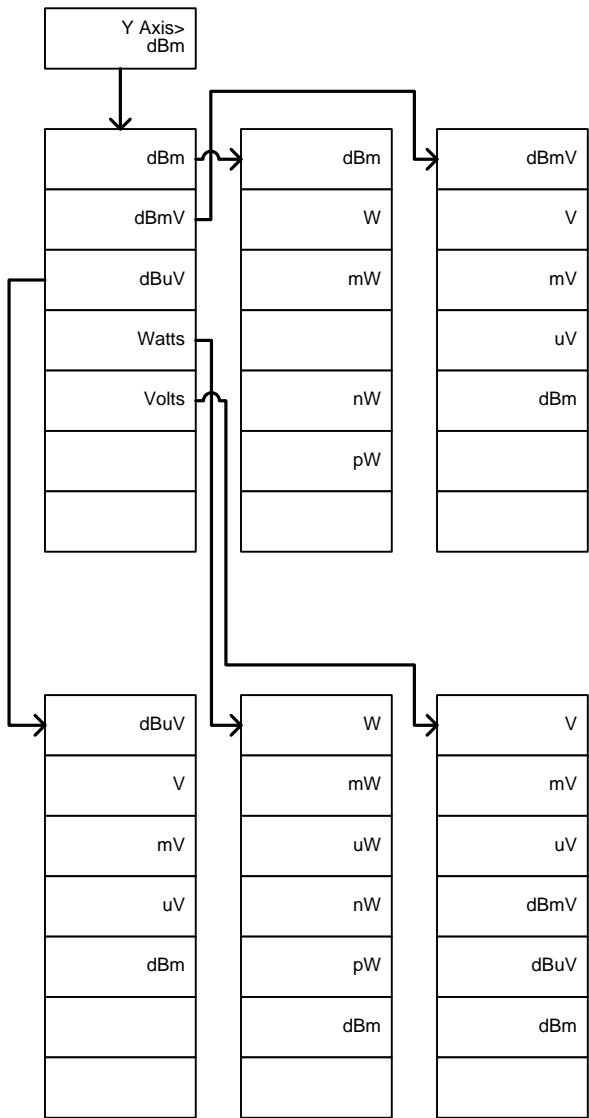
| | | |
|-----------|---|--|
| Frequency | | |
| | Center Frequency: 1.5GHz Stop Frequency: 3GHz Frequency Offset: 0Hz | Start Frequency: 0Hz CF Step: Auto |
| Span | | |
| | Span: 3GHz | |
| Amplitude | | |
| | Reference level: 0.00dBm Scale Div: 10 Scale: Off Reference level offset: 0.00dBm Input Z: 50Ω Preamp: Bypass | Attenuation: Auto Scale Type: Log Y Axis: dBm Correction: Off Input Z calibration: 0.000dB |
| Autoset | | |
| | Amp.Floor: Auto | Span: Auto |
| BW/Avg | | |
| | RBW: Auto VBW/RBW: N/A Average Power: Log Power | VBW: Auto Average: Off EMI Filter: Off |
| Sweep | | |
| | Sweep Time: Auto Gated Sweep: Off Gate Length: 540ms | Sweep: Continuous Gate Delay: 50ms |
| Trace | | |
| | Activated traces: trace 1 Trace Math: Off | Trace Type: Clear and Write Detection: Auto, Normal |
| Display | | |
| | Window Setup: Spectrum LCD Backlight: On | LCD Brightness: Hi Display Line, -50.0dBm, Off |

| | | |
|-------------|-----------------------------|--------------------------|
| Meas | | |
| | ACPR: Off | OCBW: Off |
| | AM Analysis: Off | FM Analysis: Off |
| | Ear phone Out: Off | NdB BW: Off |
| | Phase Jitter: Off | SEM: Off |
| | TOI: Off | CNR/CSO/CTB: Off |
| Limit Line | | |
| | Limit lines: Off | Pass/Fail Test: Off |
| Sequence | | |
| | Sequence Off | |
| Trigger | | |
| | Free Run | |
| File | | |
| | Type: All | Sort by: Name |
| Quick Save | | |
| | Type: Screen | Data Source:Normal |
| Save | | |
| | Type: Screen | Data Source:Normal |
| Recall | | |
| | Type: State | Destination: Local State |
| Marker | | |
| | Marker: Off | Data Source:Normal |
| Marker-> | | |
| | N/A | |
| Peak Search | | |
| | Peak Track: Off | Peak Excursion: 10dB |
| | Peak Threshold: 50dBm | Peak Table: Off |
| Mode | | |
| | Mode: Spectrum | |
| System | | |
| | Language: region dependent | Power On: Preset |
| | Preset Type: Factory Preset | Alarm Output: Off |
| | | Remote Interface Config |
| | | GPIO Address: 2 |
| | Option | LAN: DHCP |
| | Tracking generator: Off | RS232 BaudRate: 115200 |
| | | USB Mode: Host |

Menu Tree

Amplitude



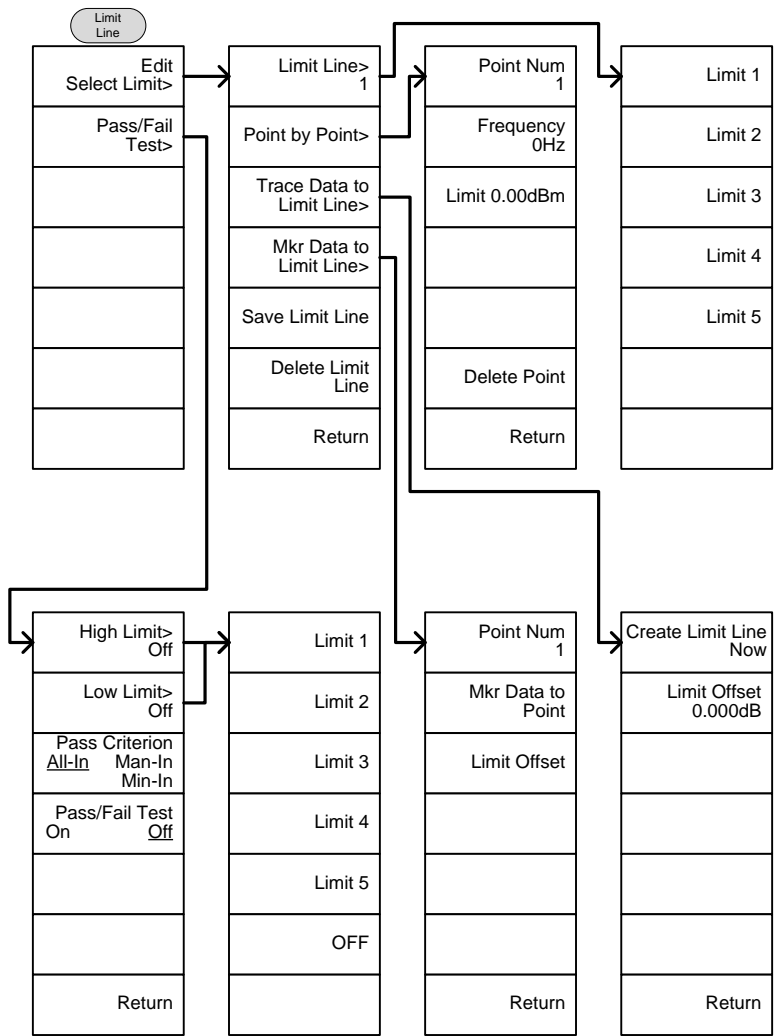


Frequency, Span, Autoset, BW Avg, Sweep

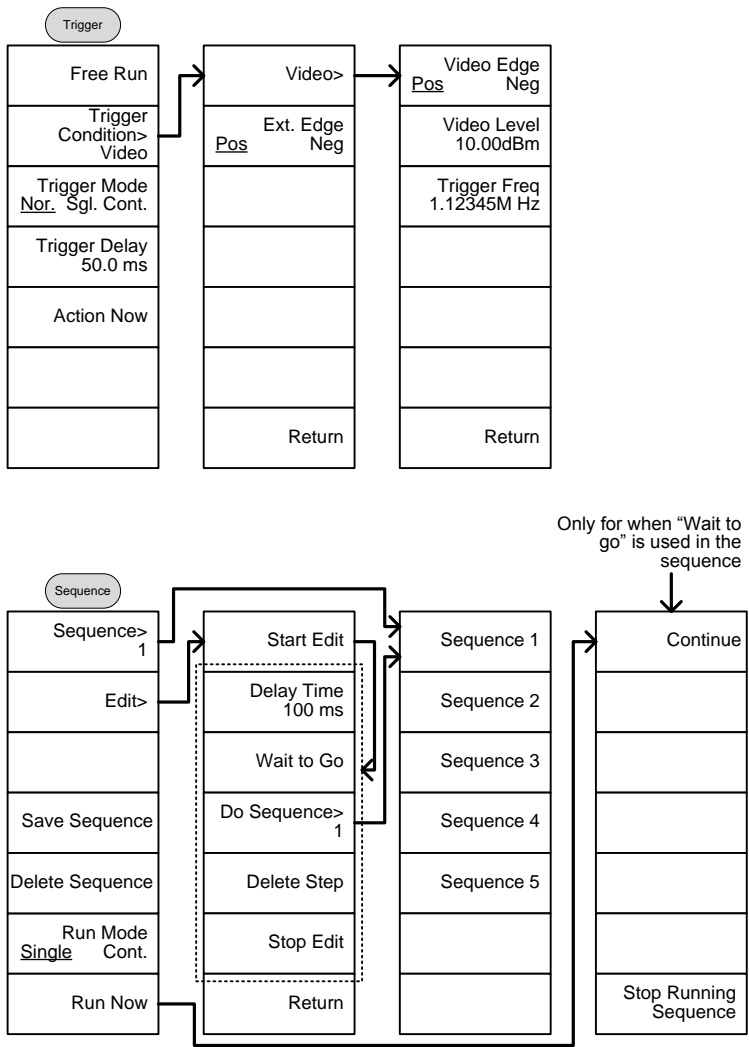
| | | |
|--|-------------------|--|
| Frequency | Span | Autoset |
| Center Freq 1.2345GHz | Span 1.2345GHz | Autoset |
| Start Freq 1.2345GHz | Full Span | Amp. Floor -80.00dBm <u>Auto</u> Man |
| Stop Freq 1.2345GHz | Zero Span | Span 3.000000MHz <u>Auto</u> Man |
| CF Step 1.00000MHz <u>Auto</u> Man | Last Span | |
| Freq Offset 0.00Hz | | |
| | | |
| | | |

| | | |
|--------------------------------|---------------|---|
| BW/Avg | | Sweep |
| RBW 1MHz <u>Auto</u> Man | LOG Power | Sweep Time 50.00 ms <u>Auto</u> Man |
| VBW 1MHz <u>Auto</u> Man | Volt Average | Sweep Single |
| VBW/RBW 1.00000 | Power Average | Sweep Cont |
| Average 20 On Off | | Gated Sweep Mode <u>On</u> Off |
| Average Type> Log Power | | Gate Delay 50.0 ms |
| EMI Filter On Off | | Gate Length 540 ms |
| | | |

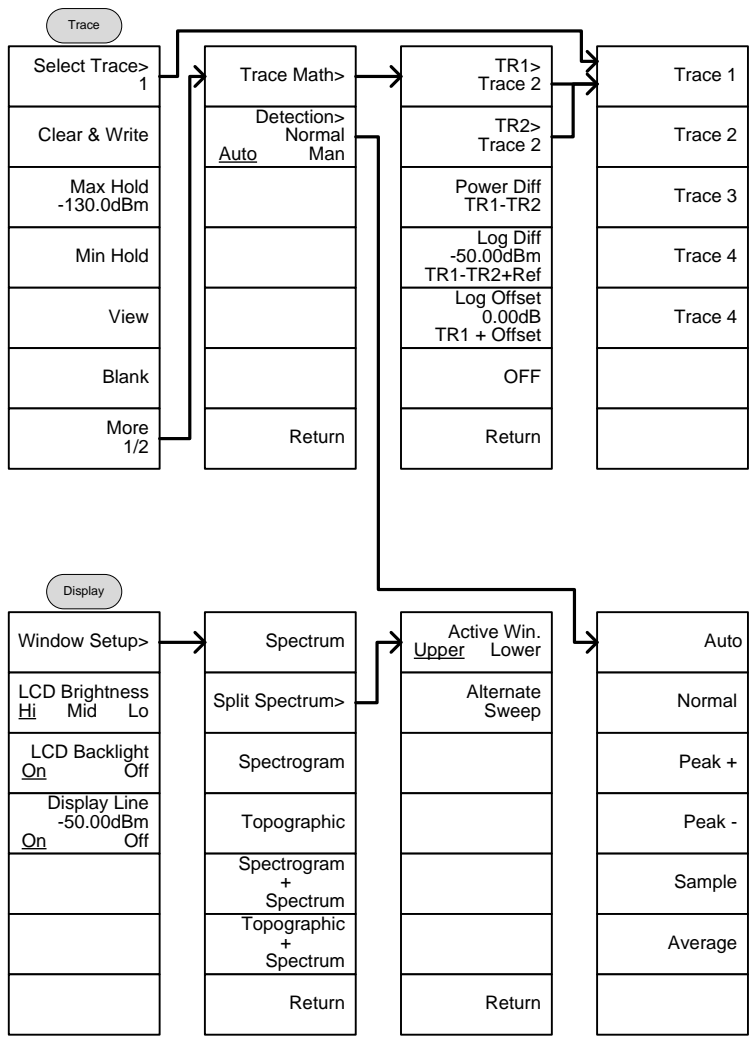
Limit Line



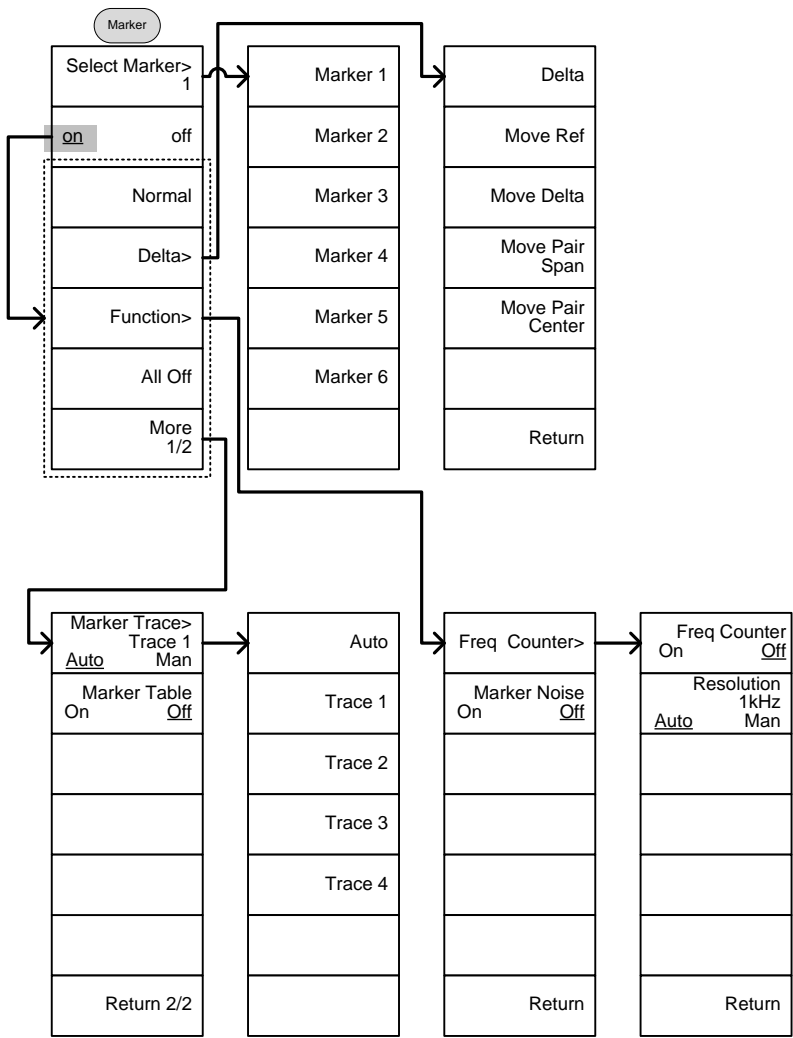
Trigger, Sequence



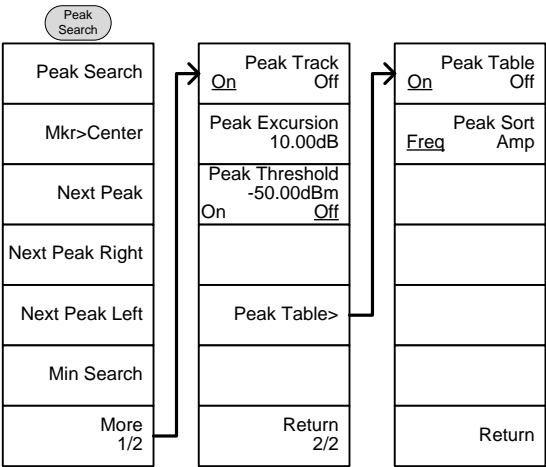
Trace, Display



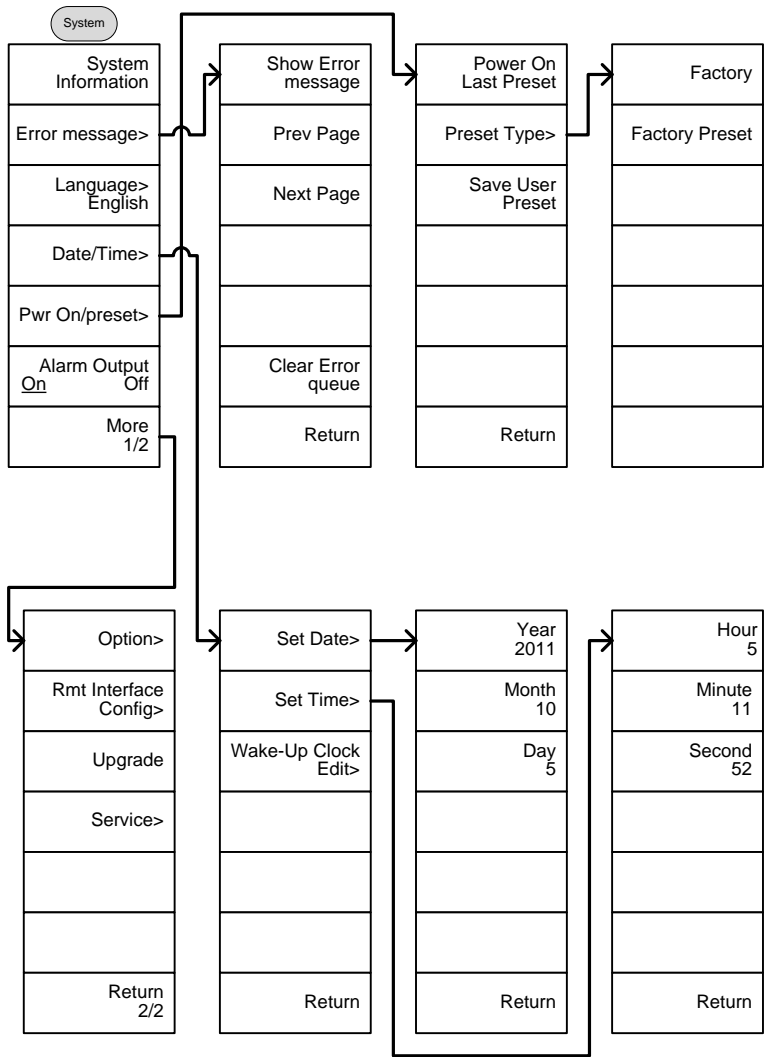
Marker



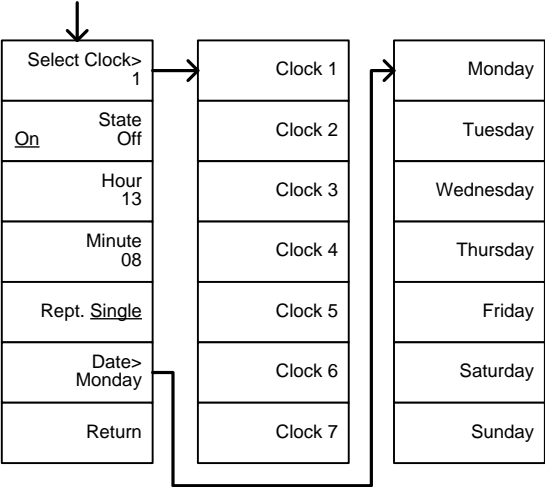
Peak Search, Marker->



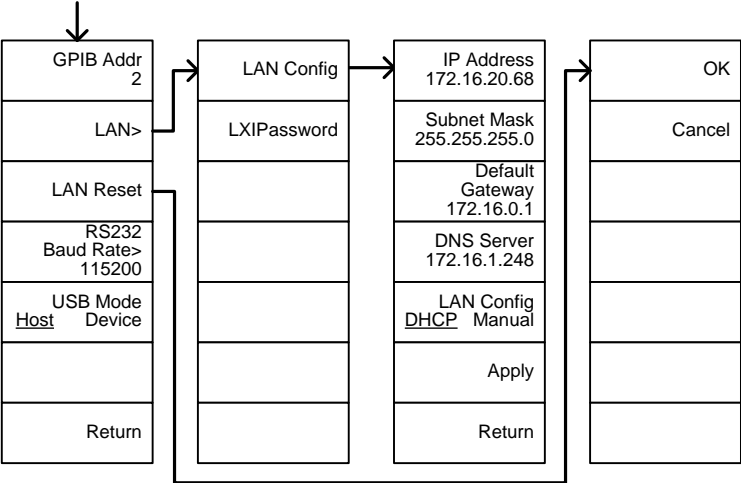
System



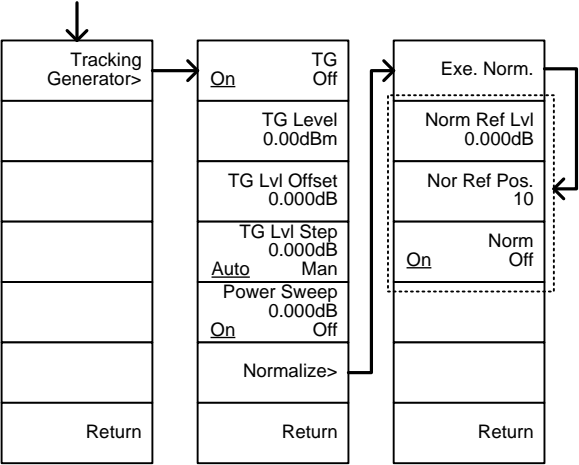
From: System>Date/
Time>Wake-Up Clock Edit>



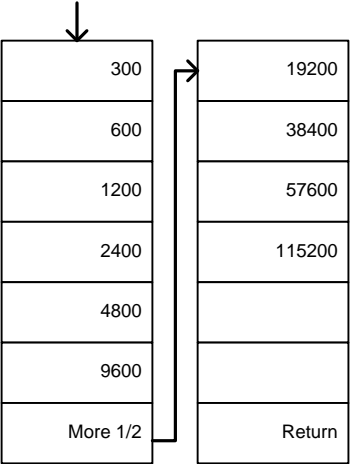
From: System>More 1/2>
Rmt Interface Config>



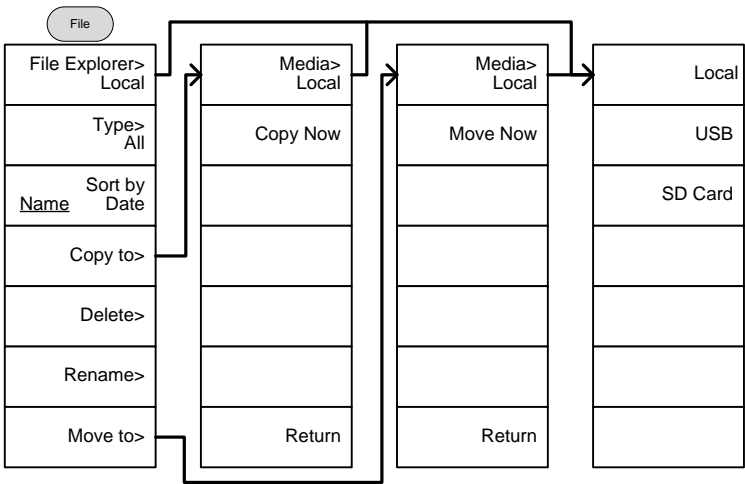
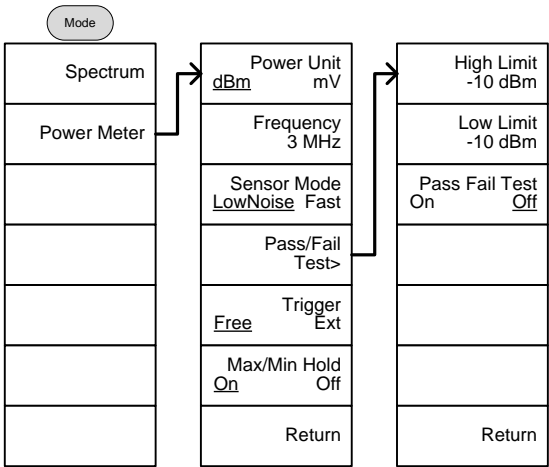
From: System> More 1/2
>Option

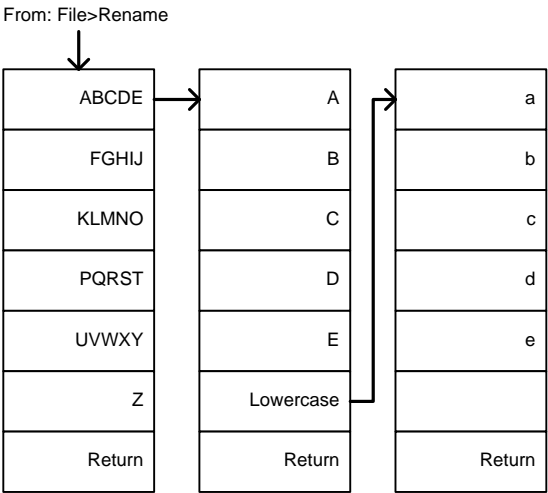
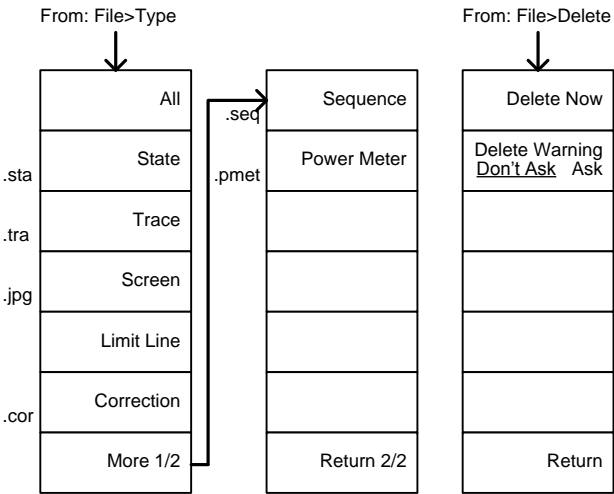


From: System>More 1/2>
Rmt Interface Config>
RS232 Baud Rate



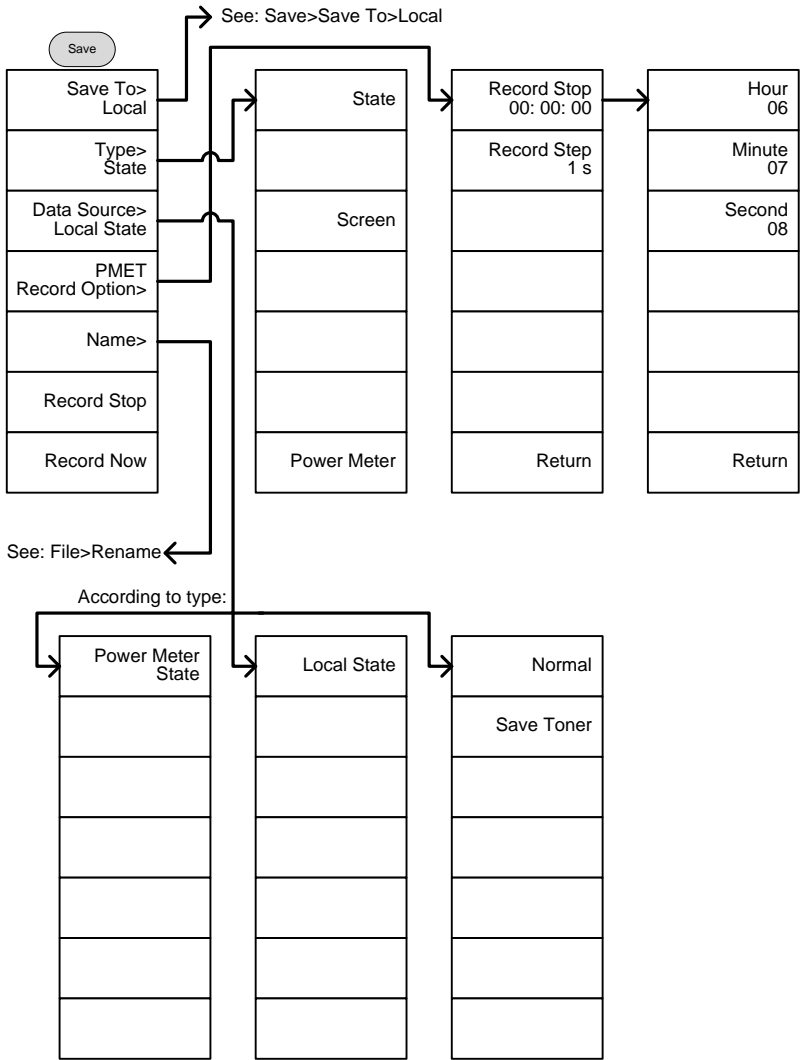
Mode, File



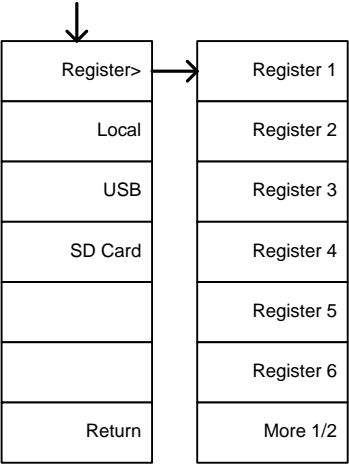


Save

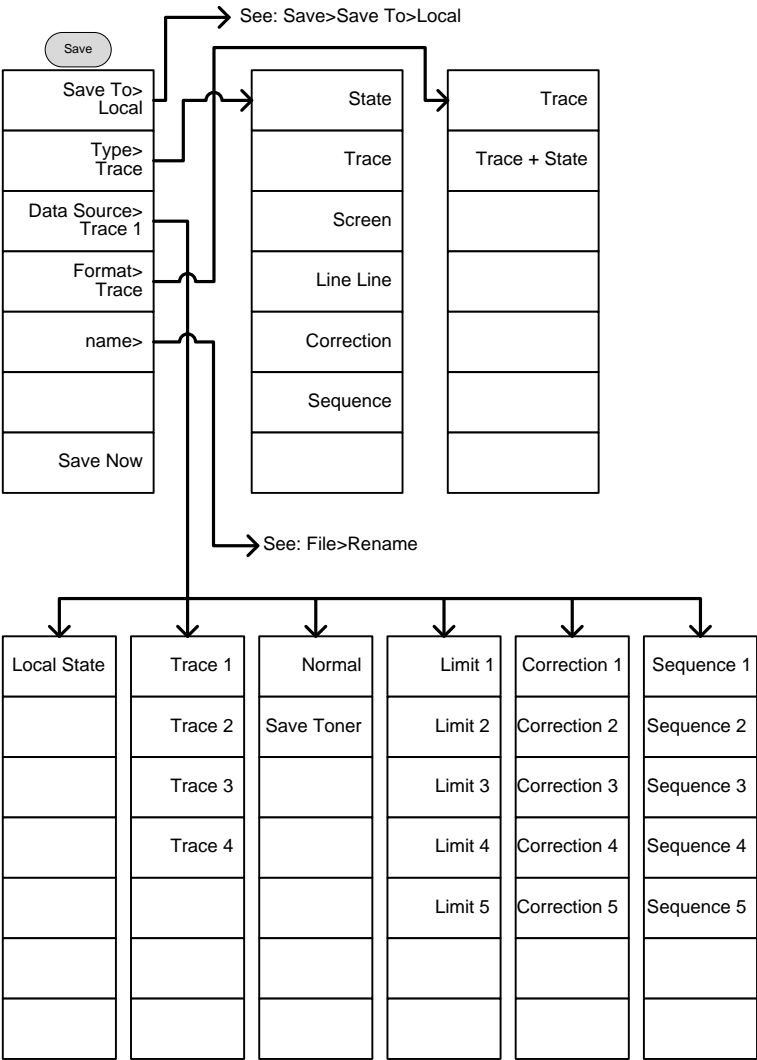
(Mode = Power Meter)



From: Save>Save To>Local

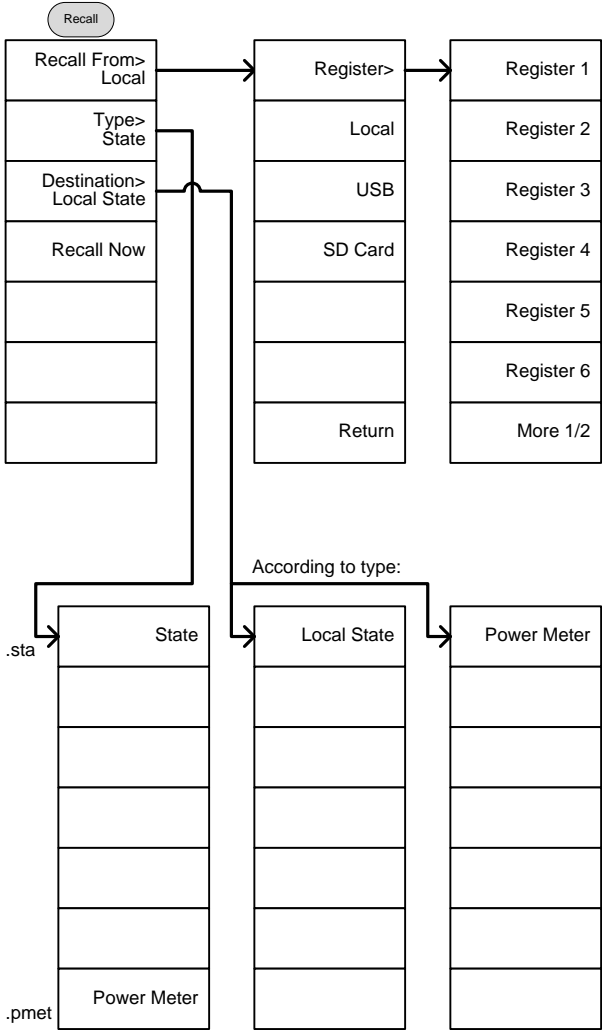


(Mode = Spectrum)

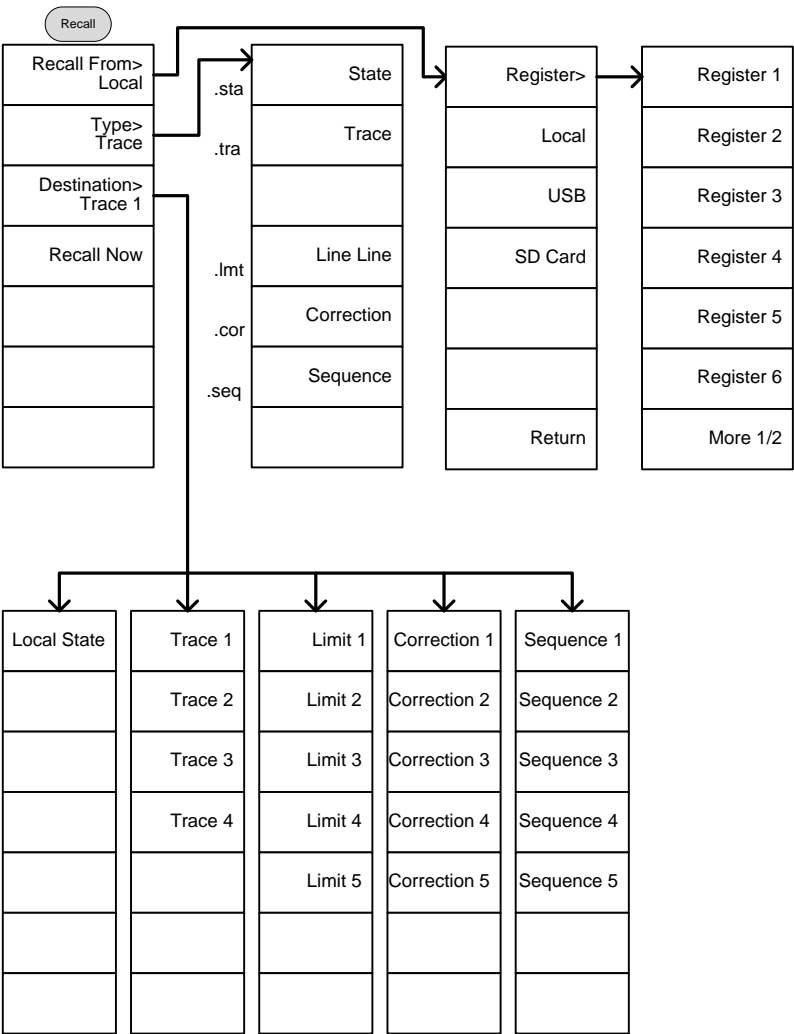


Recall

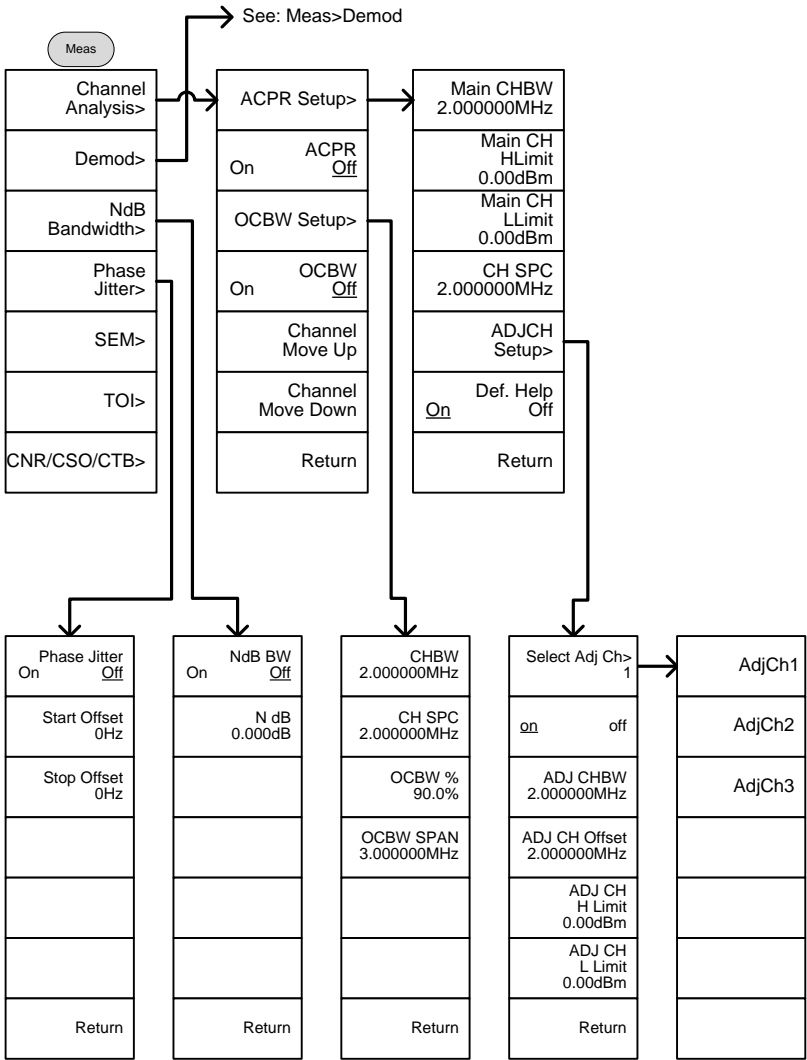
(Mode = Power Meter)



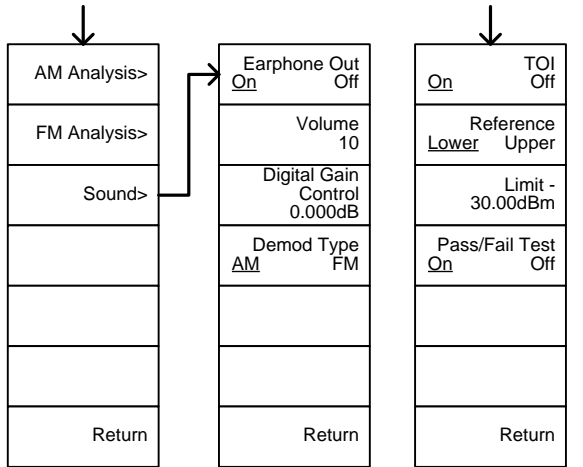
(Mode = Spectrum)



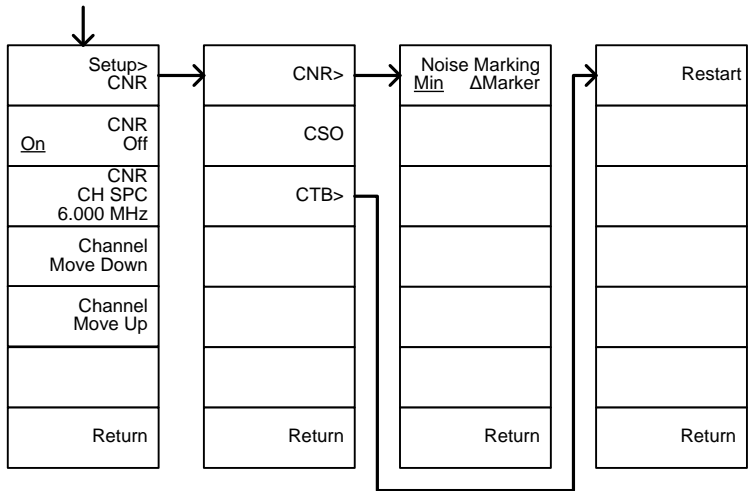
Measure



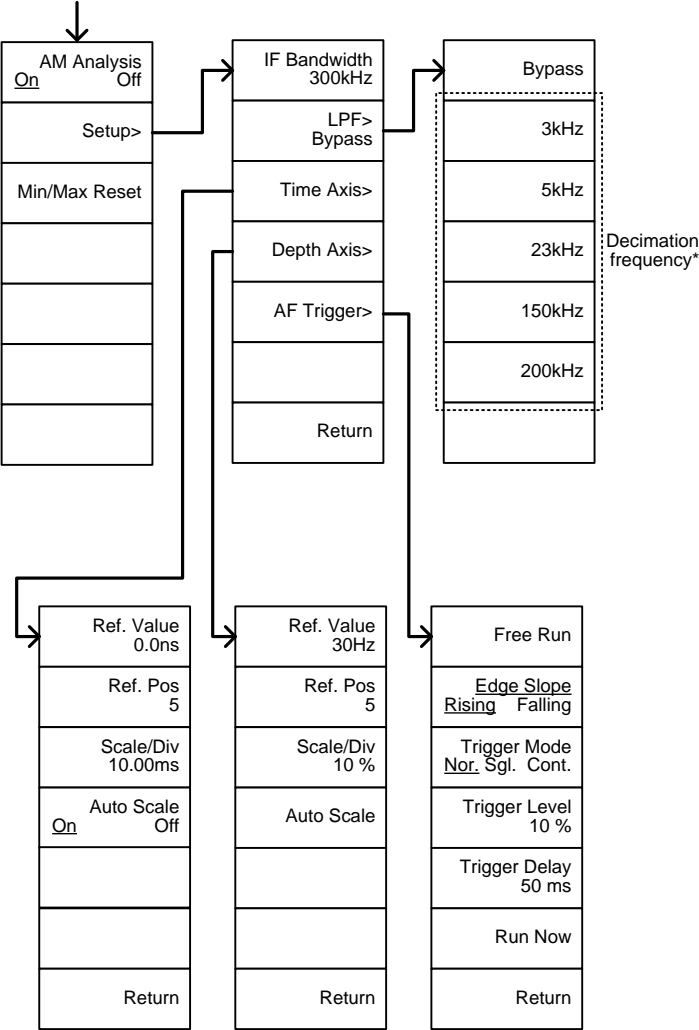
From: Measure>Demod



From: Measure>CNR/CSO/CTB

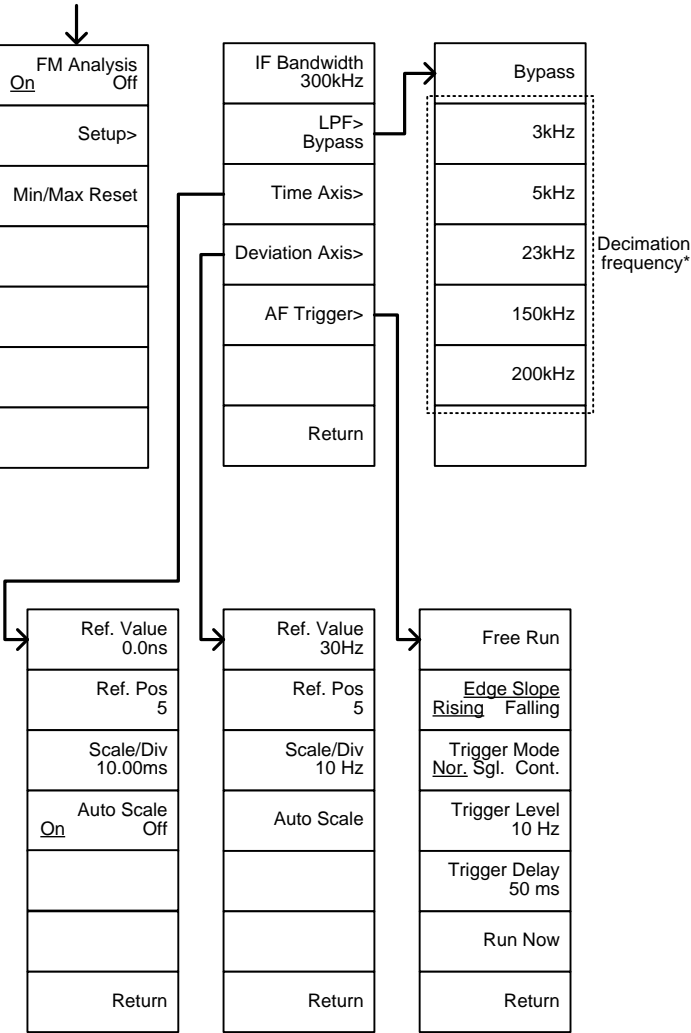


From: Measure>Demod>AM
Analysis



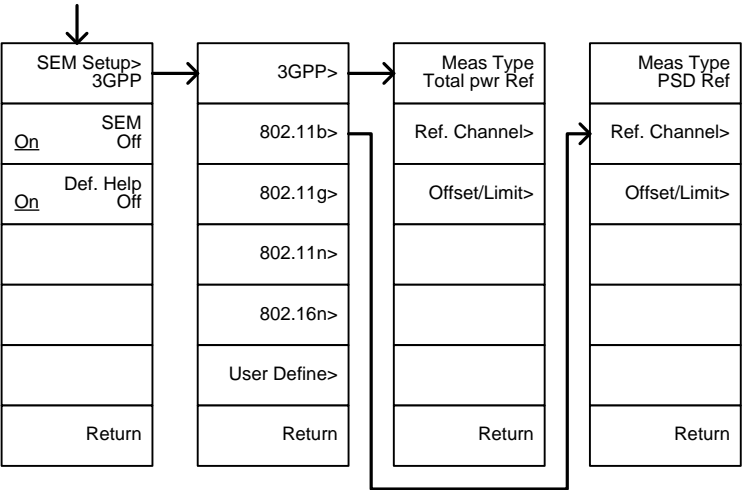
* see page 120 for the selectable LPF filter bandwidths.

From: Measure>Demod>FM
Analysis

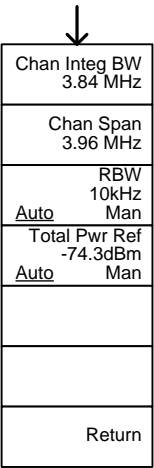


* see page 124 for the selectable LPF filter bandwidths.

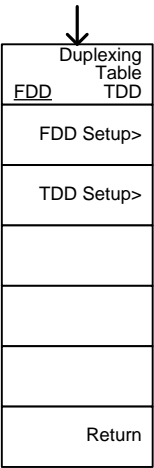
From: Measure>SEM

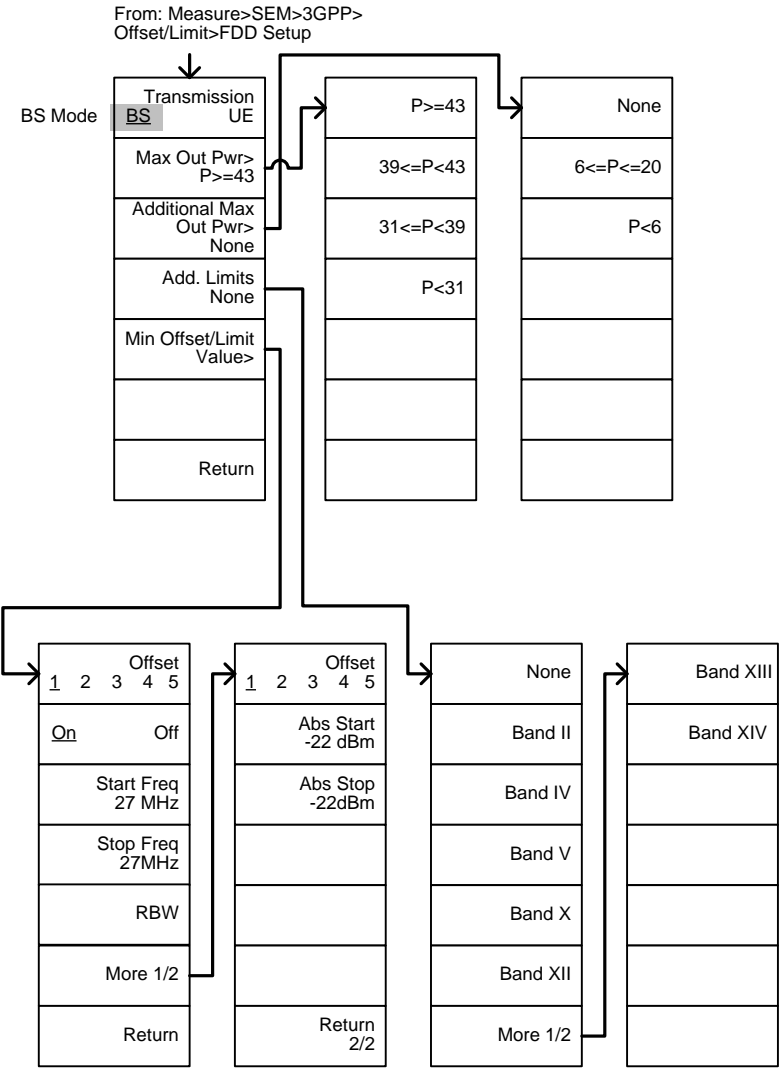


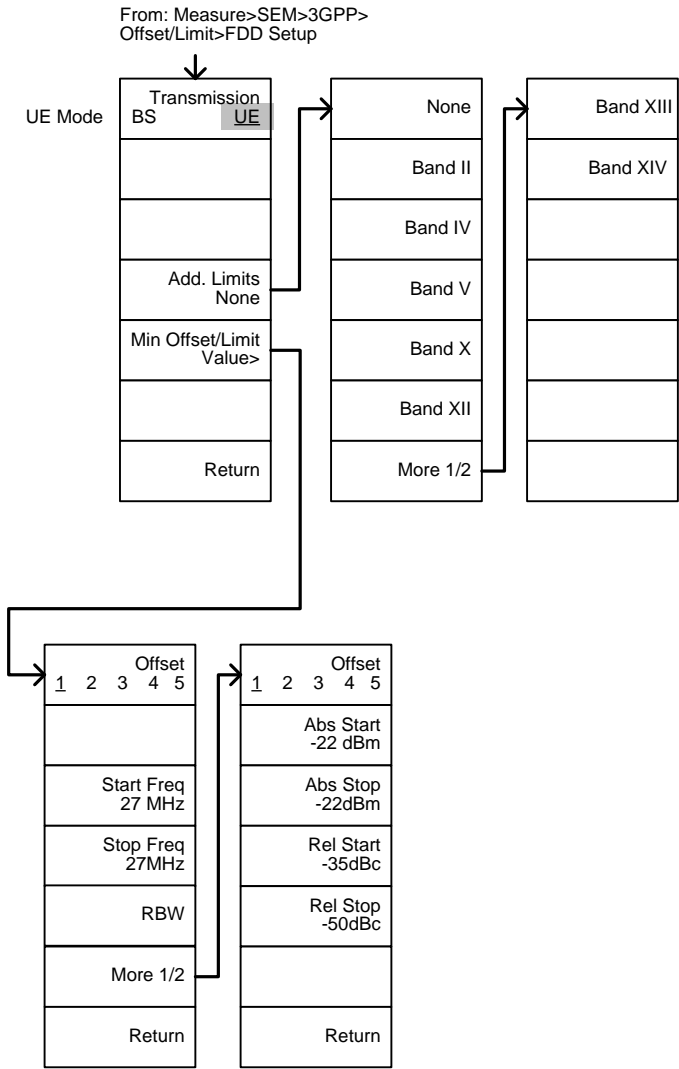
From: Measure>SEM>3GPP>
REF. Channel

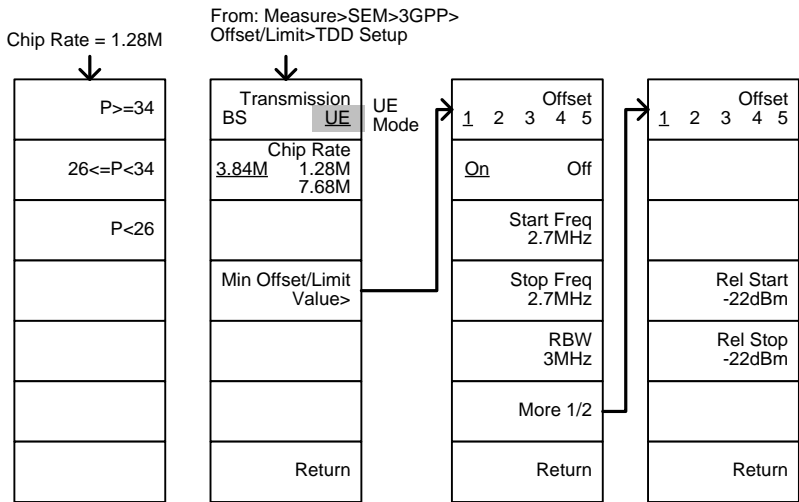
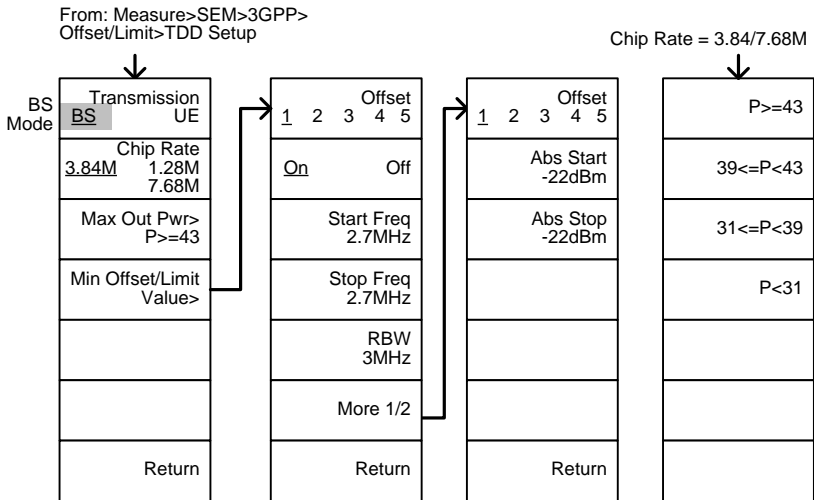


From: Measure>SEM>3GPP>
Offset/Limit









From: Measure>SEM>
802.11b/g/n/
802.16>Ref. Channel

↓

| |
|--------------------------|
| Chan Integ BW 3.84MHz |
| Chan Span 3.96MHz |
| RBW 10kHz |
| PSD Ref -74.3dBm/Hz |
| |
| |
| Return |

From:
Measure>SEM>
802.11g>Offset/
Limit

↓

| |
|---------------------------------------|
| Modulation> ERP-OFDM/ DSSS-OFDM |
| Min Offset/Limit Value> |
| |
| |
| |
| |
| Return |

→

| |
|-----------------------------------|
| ERP-OFDM/ DSSS-OPEM |
| ERP-DSSS/ ERP-PBCC/ ERP-CCK |
| |
| |
| |
| |
| |

From:
Measure>SEM>
802.11n>Offset/
Limit

↓

| |
|----------------------------|
| CH BW <u>20M</u> 40M |
| Min Offset/Limit Value> |
| |
| |
| |
| |
| Return |

From:
Measure>SEM>
802.16>Offset/Limit

↓

| |
|----------------------------|
| CH BW <u>10M</u> 20M |
| Min Offset/Limit Value> |
| |
| |
| |
| |
| Return |

From:
Measure>SEM>
802.11b>Offset/Limit

↓

| |
|----------------------|
| Offset <u>1</u> 2 |
| Start Freq 2.7MHz |
| Stop Freq 2.7MHz |
| RBW 3MHz |
| Rel Start -22dBc |
| Rel Stop -22dBc |
| Return |

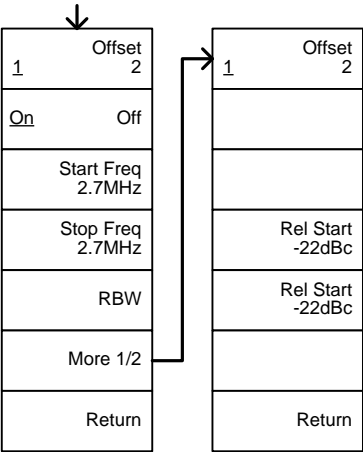
From: Measure>SEM>
802.11n/802.16>Offset/Limit>
Min Offset/Limit

↓

| |
|--------------------------|
| Offset <u>1</u> 2 3 4 |
| Start Freq 2.7MHz |
| Stop Freq 2.7MHz |
| RBW 3MHz |
| Rel Start -22dBc |
| Rel Stop -22dBc |
| Return |

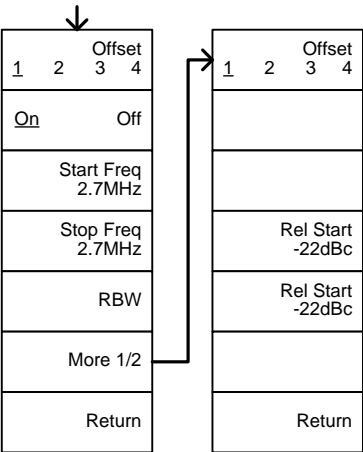
From: Measure>SEM>802.11g>
Offset/Limit>Min Offset/Limit

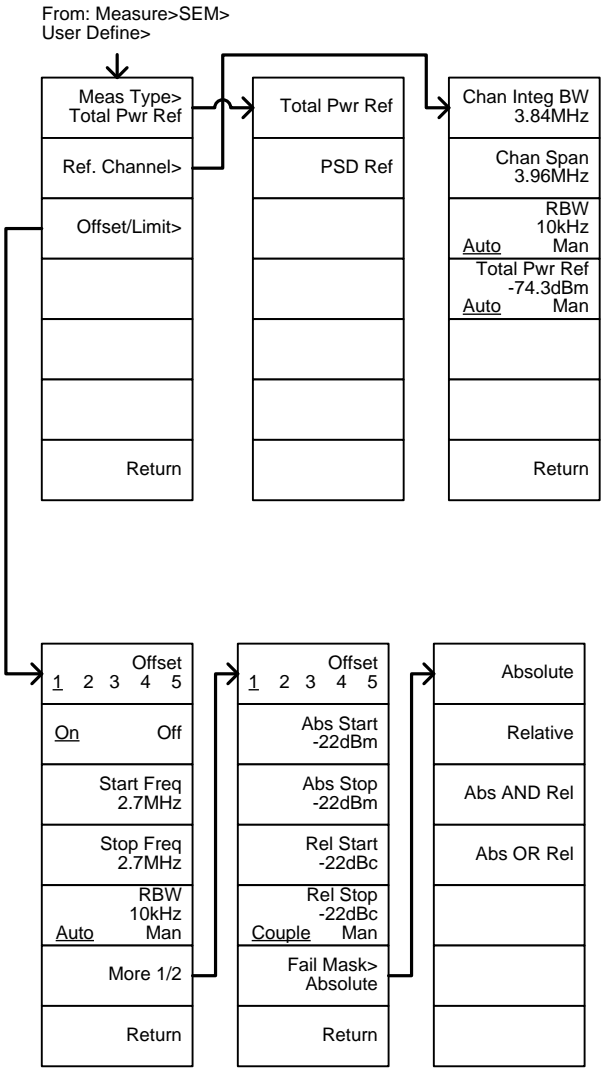
802.11g modulation=DSSS



From: Measure>SEM>802.11g>
Offset/Limit>Min Offset/Limit

802.11g modulation=OFDM





GSP-930 Specifications

The specifications apply when the GSP is powered on for at least 30 minutes to warm-up to a temperature of 20°C to 30°C, unless specified otherwise.

Frequency

| Frequency | | | |
|----------------------------|--------------------------------------|---|---|
| | Range | 9 kHz to 3.0 GHz | |
| | Resolution | 1 Hz | |
| Frequency Reference | | | |
| | Accuracy | $\pm[(\text{period since last adjustment} \times \text{aging rate}) + \text{stability over temperature} + \text{supply voltage stability}]$ | |
| | Aging Rage | ± 2 ppm max. | 1 year after last adjustment |
| | Frequency Stability over Temperature | ± 0.025 ppm | 0 to 50 °C |
| | Supply Voltage Stability | ± 0.02 ppm | |
| Frequency Readout Accuracy | | | |
| | Start, Stop, Center, Marker | $\pm(\text{marker frequency indication} \times \text{frequency reference accuracy} + 10\% \times \text{RBW} + \text{frequency resolution}^1)$ | |
| | Sweep points | 601 | Span > 0 |
| | | 6 to 601 | Span = 0 |
| Marker Frequency Counter | | | |
| | Resolution | 1 Hz, 10 Hz, 100 Hz, 1 kHz | |
| | Accuracy | $\pm(\text{marker frequency indication} \times \text{frequency reference accuracy} + \text{counter resolution})$ | RBW/Span ≥ 0.02 ; Mkr level to DNL>30 dB |
| Frequency Span | | | |
| | Range | 0 Hz (zero span), 100 Hz to 3 GHz | |
| | Resolution | 1 Hz | |
| | Accuracy | $\pm \text{frequency resolution}^1$ | |

Phase Noise

| | | |
|---------------------|--------------|---|
| Offset from Carrier | | Fc = 1 GHz; RBW = 1 kHz, VBW = 10 Hz; Average ≥ 40 |
| 10 kHz | <-88 dBc/Hz | <i>Typical^k</i> |
| 100 kHz | <-95 dBc/Hz | <i>Typical</i> |
| 1 MHz | <-113 dBc/Hz | <i>Typical</i> |

Resolution Bandwidth (RBW) Filter

| | | |
|------------------|--|--|
| Filter Bandwidth | 10 Hz to 3 kHz in 1-3-10 sequence | -3dB bandwidth subtotal: 6 filters |
| | 10 kHz to 1 MHz, increment in 10% step | -3dB bandwidth; min. RBW = 10 kHz @ zero span Subtotal: 49 filters |
| | 200 Hz, 9 kHz, 120 kHz | -6dB bandwidth |
| | | |
| Accuracy | $\pm 8\%$, RBW ≥ 750 kHz | Nominal ³ |
| | $\pm 5\%$, RBW < 750 kHz | Nominal |
| Shape Factor | < 4.5:1 | Normal Bandwidth ratio: -60dB:-3dB |

Video Bandwidth (VBW) Filter

| | | |
|------------------|----------------------------------|----------------|
| Filter Bandwidth | 1 Hz to 1 MHz in 1-3-10 sequence | -3dB bandwidth |
|------------------|----------------------------------|----------------|

[1] Frequency Resolution = Span/(Sweep points - 1)

[2] Typical specifications in this datasheet mean that the performance can be exhibited in 80% of the units with a 95% confidence level over the temperature range 20 to 30 °C. They are not covered by the product warranty.

[3] Nominal values indicate expected performance. They are not covered by the product warranty.

Amplitude

Amplitude Range

| | | |
|-------------------|------------------|--|
| Measurement Range | 100 kHz to 1 MHz | Displayed Average Noise Level (DANL) to 18 dBm |
| | 1 MHz to 10 MHz | DANL to 21 dBm |
| | 10 MHz to 3 GHz | DANL to 30 dBm |

Attenuator

| | | |
|------------------------|--------------------------|----------------------|
| Input Attenuator Range | 0 to 50 dB, in 1 dB step | Auto or manual setup |
|------------------------|--------------------------|----------------------|

Maximum Safe Input Level

| | | |
|---------------------|----------------|-------------------------------|
| Average Total Power | $\geq +33$ dBm | Input attenuator ≥ 10 dB |
| DC Voltage | ± 50 V | |

1 dB Gain Compression

| | | |
|---------------------------|-----------|--|
| Total Power at 1st Mixer | > 0 dBm | <i>Typical</i> ; $F_c \geq 50$ MHz; preamp. off |
| Total Power at the Preamp | > -22 dBm | <i>Typical</i> ; $F_c \geq 50$ MHz; preamp. on |
| | | mixer power level (dBm) = input power (dBm) - attenuation (dB) |

Displayed Average Noise Level (DANL)

| | | |
|------------------|--|---------|
| Preamp off | 0 dB attenuation; RBW 10 Hz; VBW 10 Hz; span 500 Hz; reference level = -60dBm; trace average ≥ 40 | |
| 9 kHz to 100 kHz | < -93 dBm, | |
| 100 kHz to 1 MHz | < -90 dBm - 3 x (f/100 kHz) dB | Nominal |
| 1 MHz to 10 MHz | < -122 dBm | |
| 10 MHz to 3 GHz | < -122 dBm | |
| Preamp on | 0 dB attenuation; RBW 10 Hz; VBW 10Hz; span 500 Hz; reference level = -60dBm; trace average ≥ 40 | |
| 100 kHz to 1 MHz | < -108 dBm - 3 x (f/100 kHz) dB | |
| 1 MHz to 10 MHz | < -142 dBm | Nominal |
| 10 MHz to 3 GHz | < -145 dBm + 3 x (f/1 GHz) dB | |

Level Display Range

| | | |
|---------------------|--|--|
| Scales | Log, Linear | |
| Units | dBm, dBmV, dBuV, V, W | |
| Marker Level | 0.01 dB | Log scale |
| Readout | 0.01 % of reference level | Linear scale |
| Level Display Modes | Trace, Topographic, Spectrogram | Single / split Windows |
| Number of Traces | 4 | |
| Detector | Positive-peak, negative-peak, sample, normal, RMS(not Video) | Can be setup for each trace separately |
| Trace Functions | Clear & Write, Max/Min Hold, View, Blank, Average | |

Absolute Amplitude Accuracy

| | | |
|----------------|--|--|
| Absolute Point | Center=160 MHz ; RBW 10 kHz; VBW 1 kHz; span 100 kHz; log scale; 1 dB/div; peak detector; 20 to 30°C; signal 0 dBm | |
| Preamp off | ± 0.3 dB | Ref level 0 dBm; 10 dB RF attenuation |
| Preamp on | ± 0.4 dB | Ref level -30 dBm; 0 dB RF attenuation |

Frequency Response

| | | |
|--------------------|--|--|
| Preamp off | Attenuation: 10 dB; Reference: 160 MHz; 20 to 30°C | |
| 100 kHz to 2.0 GHz | ± 0.5 dB | |
| 2.0GHz to 3.0 GHz | ± 0.7 dB | |
| Preamp on | Attenuation: 0 dB; Reference: 160 MHz; 20 to 30°C | |
| 1 MHz to 2.0 GHz | ± 0.6 dB | |
| 2.0GHz to 3.0 GHz | ± 0.8 dB | |

Attenuation Switching Uncertainty

| | | |
|--|---------------|--------------------------------------|
| Attenuator setting 0 to 50 dB in 1 dB step | | |
| Uncertainty | ± 0.15 dB | reference: 160 MHz, 10dB attenuation |

RBW Filter Switching Uncertainty

| | | |
|----------------|---------------|------------------------|
| 10 Hz to 1 MHz | ± 0.15 dB | reference : 10 kHz RBW |
|----------------|---------------|------------------------|

Level Measurement Uncertainty

| | | |
|----------------------------|--------------|--|
| Overall Amplitude Accuracy | ± 1.5 dB | 20 to 30°C; frequency > 1 MHz; Signal input 0 to -50 dBm; Reference level 0 to -50 dBm; Input attenuation 10 dB; RBW 1 kHz; VBW 1 kHz; after cal; Preamp Off |
| | ± 0.5 dB | <i>Typical</i> |

Spurious Response

| | | |
|------------------------------|-----------|---|
| Second Harmonic Intercept | | Preamp off; signal input -30dBm; 0 dB attenuation |
| | +35 dBm | <i>Typical</i> ; 10 MHz < f_c < 775 MHz |
| | +60 dBm | <i>Typical</i> ; 775 MHz $\leq f_c$ < 1.5 GHz |
| Third-order Intercept | | Preamp off; signal input -30dBm; 0 dB attenuation |
| | > 1dBm | 300 MHz to 3 GHz |
| Input Related Spurious | < -60 dBc | Signal level -30 dBm at 1st mixer; 20 to 30°C |
| Residual Response (inherent) | < -90 dBm | Input terminated; 0 dB attenuation; Preamp off |

Sweep
Sweep Time

| | | |
|----------------|---------------------------|--|
| Range | 22 ms to 1000 s | Span > 0 Hz |
| | 50 μ s to 1000 s | Span = 0 Hz; Min Resolution = 10 μ s |
| Sweep Mode | Continuous; Single | |
| Trigger Source | Free run; Video; External | |
| Trigger Slope | Positive or negative edge | |

RF Preamplifier

| | | |
|-----------------|----------------|------------------------------------|
| Frequency Range | 1 MHz to 3 GHz | |
| Gain | 18 dB | Nominal (installed as standard) |

Front Panel Input/Output
RF Input

| | | |
|----------------|-----------------|--|
| Connector Type | N-type female | |
| Impedance | 50 ohm, nominal | |
| VSWR | <1.6 :1 | 300 kHz to 3 GHz; Input attenuator \geq 10 dB |

Power for Option

| | | |
|-----------------|---------------------|-------------------------------|
| Connector Type | SMB male | |
| Voltage/Current | DC +7V / 500 mA max | With short-circuit protection |

USB Host

| | | |
|----------------|-------------|------------------------------|
| Connector Type | A plug | |
| Protocol | Version 2.0 | Supports Full/High/Low speed |

MicroSD Socket

| | | |
|-----------------|--------------------|---------------------|
| Protocol | SD 1.1 | |
| Supported Cards | microSD, microSDHC | Up to 32GB capacity |

Rear Panel Input/Output

Reference Output

| | |
|------------------|------------|
| Connector Type | BNC female |
| Output Frequency | 10 MHz |
| Output Amplitude | 3.3V CMOS |
| Output Impedance | 50 ohm |

Reference Input

| | |
|---------------------------|---|
| Connector Type | BNC female |
| Input Reference Frequency | 10 MHz |
| Input Amplitude | -5 dBm to +10 dBm |
| Frequency Lock Range | Within ± 5 ppm of the input reference frequency |

Alarm Output

| | |
|----------------|----------------------------|
| Connector Type | BNC female; Open-collector |
|----------------|----------------------------|

Trigger Input/ Gated Sweep Input

| | |
|-----------------|----------------------------|
| Connector Type | BNC female |
| Input Amplitude | 3.3V CMOS |
| Switch | Auto selection by function |

LAN TCP/IP Interface

| | |
|----------------|---------------------------------|
| Connector Type | RJ-45 |
| Base | 10Base-T; 100Base-Tx; Auto-MDIX |

USB Device

| | | |
|----------------|-------------|---|
| Connector Type | B plug | For remote control only; supports USB TMC |
| Protocol | Version 2.0 | Supports Full/High speed |

| | | | |
|----------------------------------|--|--|--|
| IF Output | | | |
| Connector Type | SMA female | | |
| Impedance | 50 ohm | Nominal | |
| IF Frequency | 886 MHz | Nominal | |
| Output level | -25 dBm | 10 dB attenuation; RF input: 0 dBm @ 1 GHz; | |
| Earphone Output | | | |
| Connector Type | 3.5mm stereo jack, wired for mono operation | | |
| Video Output | | | |
| Connector Type | DVI-I (integrated analog and digital) , Single Link | Compatible with VGA or HDMI standard through adapter | |
| RS232 Interface | | | |
| Connector Type | D-sub 9-pin female | Tx,Rx,RTS,CTS | |
| GPIO Interface (Optional) | | | |
| Connector Type | IEEE-488 bus connector | | |
| AC Power Input | | | |
| Power Source | AC 100 V to 240 V, 50 / 60 Hz | Auto range selection | |
| Battery Pack (Optional) | | | |
| Battery pack | 6 cells, Li-Ion rechargeable, 3S2P | With UN38.3 Certification | |
| Voltage | DC 10.8 V | | |
| Capacity | 5200 mAh / 56Wh | | |

General

| | | |
|-----------------------|-----------------------|--|
| Internal Data storage | 16 MB nominal | |
| Power Consumption | <65 W | |
| Warm-up Time | < 30 minutes | |
| Temperature Range | +5 °C to +45 °C | Operating |
| | -20 °C to + 70 °C | Storage |
| Weight | 4.5 kg (9.9 lb) | Inc. all options (Basic+TG+GPIO+Battery) |
| Dimensions | 210 x 350 x 100 (mm) | Approximately |
| | 8.3 x 13.8 x 3.9 (in) | |

Tracking Generator (Optional)

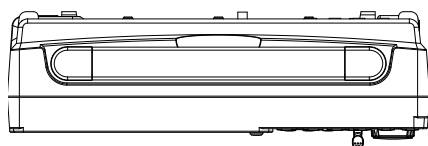
| | | |
|------------------------------------|----------------------------------|---|
| Frequency Range | 100 kHz to 3 GHz | |
| Output Power | -50 dBm to 0 dBm in 0.5 dB steps | |
| Absolute Accuracy | ± 0.5 dB | @160 MHz, -10 dBm, Source attenuation 10 dB, 20 to 30°C |
| Output Flatness | Referenced to 160 MHz, -10 dBm | |
| | 100 kHz to 2 GHz | ± 1.5 dB |
| | 2 GHz to 3 GHz | ± 2 dB |
| Output Level Switching Uncertainty | ± 0.8 dB | Referenced to -10 dBm |
| Harmonics | < -30 dBc | Typical, output level = -10 dBm |
| Reverse Power | +30 dBm max. | |
| Connector type | N-type female | |
| Impedance | 50 ohm | Nominal |
| Output VSWR | < 1.6:1 | 300 kHz to 3 GHz, source attenuation ≥ 12 dB |

USB Power Sensor (Optional)

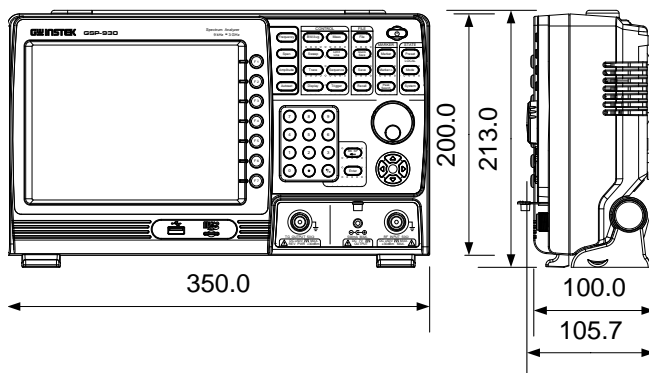
| | | |
|-------------------------|--|---------|
| Type | Average power sensor Model: PWS-06 | |
| Interface to Meter | USB cable to GSP930 Front-Panel USB Host | |
| Connector Type | N-type male, 50 ohm nominal | |
| Input VSWR | 1.1: 1 | Typical |
| | 1.3: 1 | Max |
| Input Frequency | 1 to 6200 MHz | |
| Sensing Level | -32 to +20 dBm | |
| Max. Input Damage Power | ≥ 27 dBm | |

| | | |
|-------------------|-------------------------------|--------------------|
| Power | -30 dBm to +5 dBm: | |
| Measurement | 1 MHz to 3GHz: ± 0.10 dB | |
| Uncertainty | typical | ± 0.30 dB max. |
| @ 25 °C | 3 GHz to 6 GHz: ± 0.15 dB | |
| | typical | ± 0.30 dB max. |
| | +5 dBm to +12 dBm: | |
| | 1 MHz to 3GHz: ± 0.15 dB | |
| | typical | ± 0.30 dB max. |
| | 3 GHz to 6 GHz: ± 0.15 dB | |
| | typical | ± 0.30 dB max. |
| | +12 dBm to +20 dBm: | |
| | 1 MHz to 3GHz: ± 0.20 dB | |
| | typical | ± 0.40 dB max. |
| | 3 GHz to 6 GHz: ± 0.20 dB | |
| | typical | ± 0.40 dB max. |
| Power | -30 dBm to +5 dBm: | |
| Measurement | 1 MHz to 3GHz: ± 0.25 dB | |
| Uncertainty | typical | |
| @ 0 to 25 °C | 3 GHz to 6 GHz: ± 0.25 dB | |
| | typical | |
| | +5 dBm to +12 dBm: | |
| | 1 MHz to 3GHz: ± 0.20 dB | |
| | typical | |
| | 3 GHz to 6 GHz: ± 0.20 dB | |
| | typical | |
| | +12 dBm to +20 dBm: | |
| | 1 MHz to 3GHz: ± 0.35 dB | |
| | typical | |
| | 3 GHz to 6 GHz: ± 0.30 dB | |
| | typical | |
| Linearity @ 25 °C | ± 3 % | |
| Measurement | 100 ms for Low Noise Typical | |
| Speed | Mode | |
| | 30 ms for Fast Mode | |

GSP-930 Dimensions



Unit: mm



Declaration of Conformity

We

GOOD WILL INSTRUMENT CO., LTD.

No. 7-1, Jhongsing Rd, Tucheng Dist., New Taipei City 236, Taiwan

GOOD WILL INSTRUMENT (SUZHOU) CO., LTD.

No. 69 Lushan Road, Suzhou New District Jiangsu, China.

declare that the below mentioned product

Type of Product: Spectrum Analyzer

Model Number: GSP-930

is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to the Low Voltage Directive (2006/95/EC) and Electromagnetic Compatibility (2004/108/EC).

For the evaluation regarding the Electromagnetic Compatibility and Low Voltage Directive, the following standards were applied:

◎ EMC

| EN 61326-1 : EN 61326-2-1: EN 61326-2-2: | | Electrical equipment for measurement, control and laboratory use -- EMC requirements (2006) | |
|---|--|---|--|
| Conducted and Radiated Emissions EN 55011: 2009+A1: 2010 | | Electrostatic Discharge EN 61000-4-2: 2009 | |
| Current Harmonic EN 61000-3-2: 2006+A1: 2009+A2: 2009 | | Radiated Immunity EN 61000-4-3: 2006+A1: 2008+A2 :2010 | |
| Voltage Fluctuation EN 61000-3-3: 2008 | | Electrical Fast Transients EN 61000-4-4: 2004+A1: 2010 | |
| ----- | | Surge Immunity EN 61000-4-5: 2006 | |
| ----- | | Conducted Susceptibility EN 61000-4-6: 2009 | |
| ----- | | Power Frequency Magnetic Field EN 61000-4-8: 2010 | |
| ----- | | Voltage Dips/ Interrupts EN 61000-4-11: 2004 | |

| Low Voltage Equipment Directive 2006/95/EC | |
|--|--|
| Safety Requirements | EN 61010-1: 2010 EN 61010-2-030: 2010 |

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